Chemical Age

EVANS MEDICAL OPEN NEW LABORATORIES
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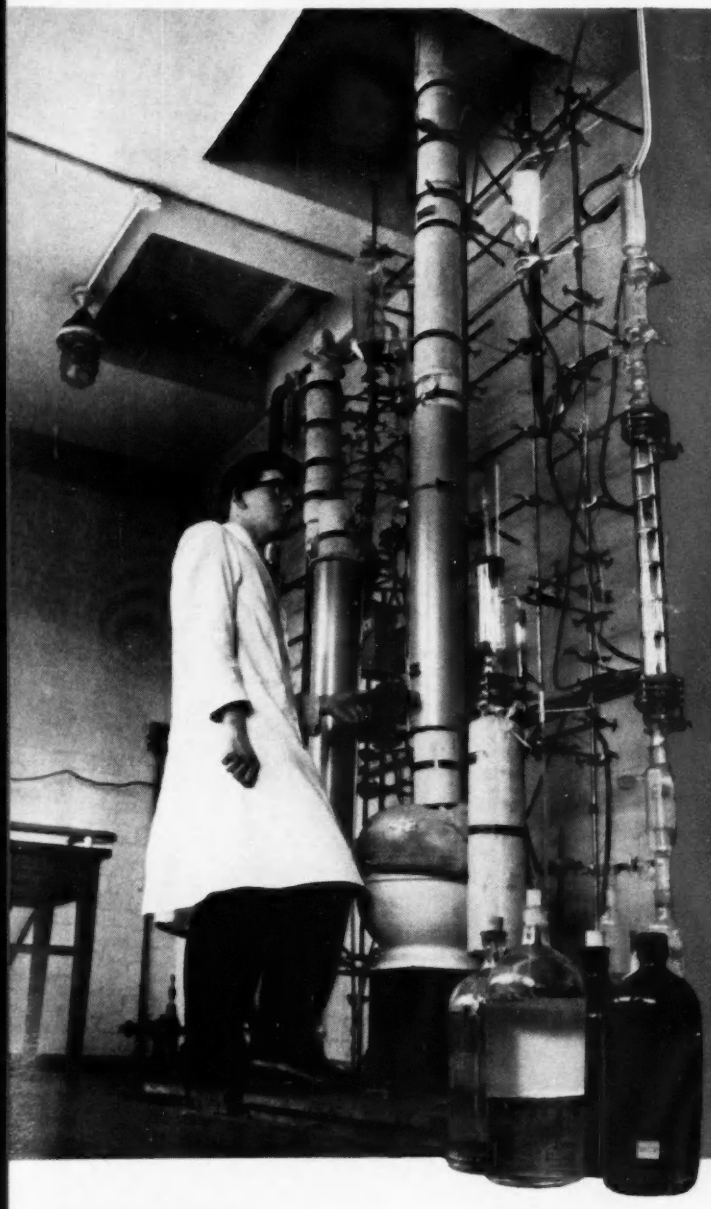
VOL. 81 No. 2082

6 June 1959



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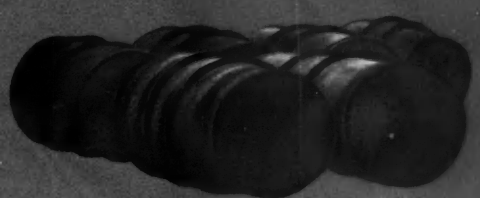

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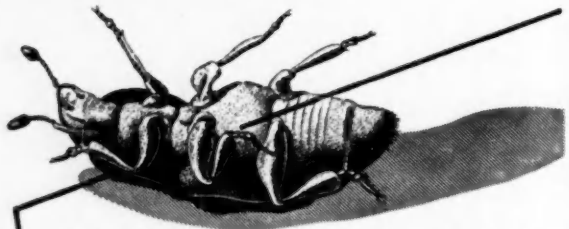

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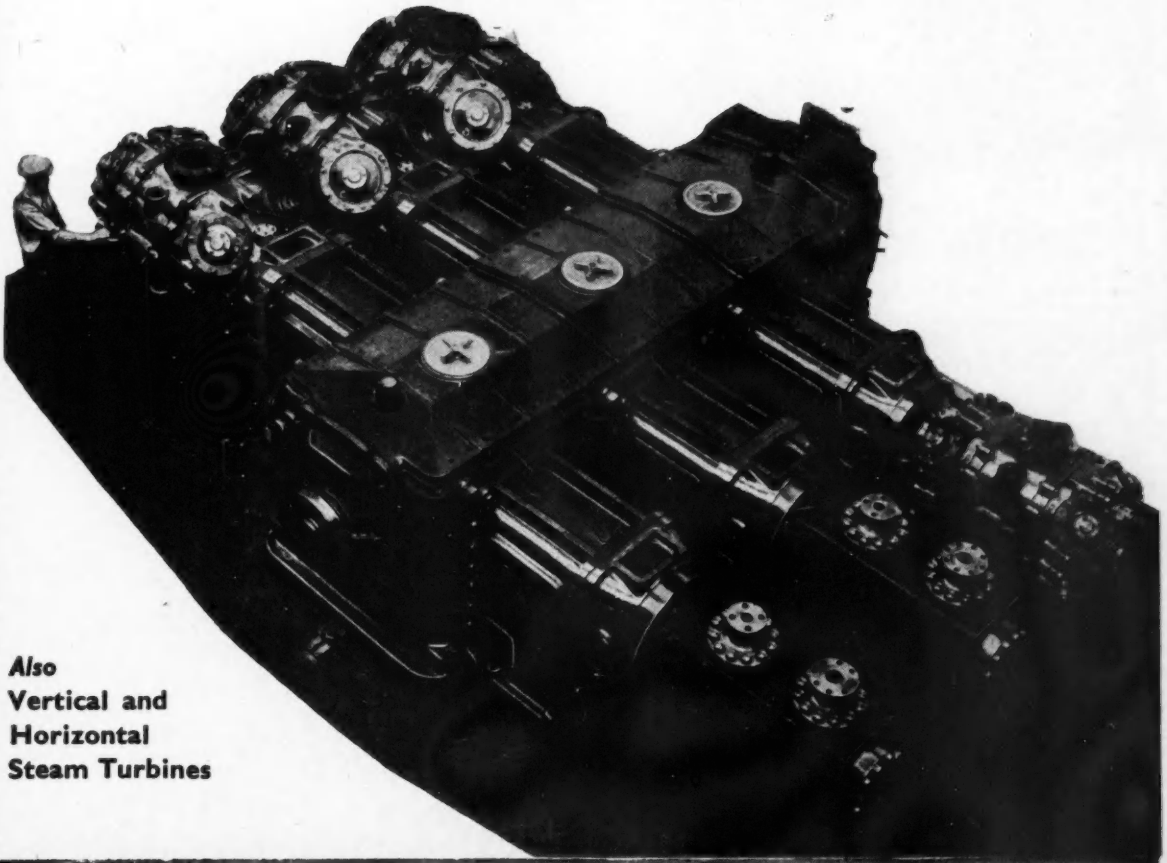

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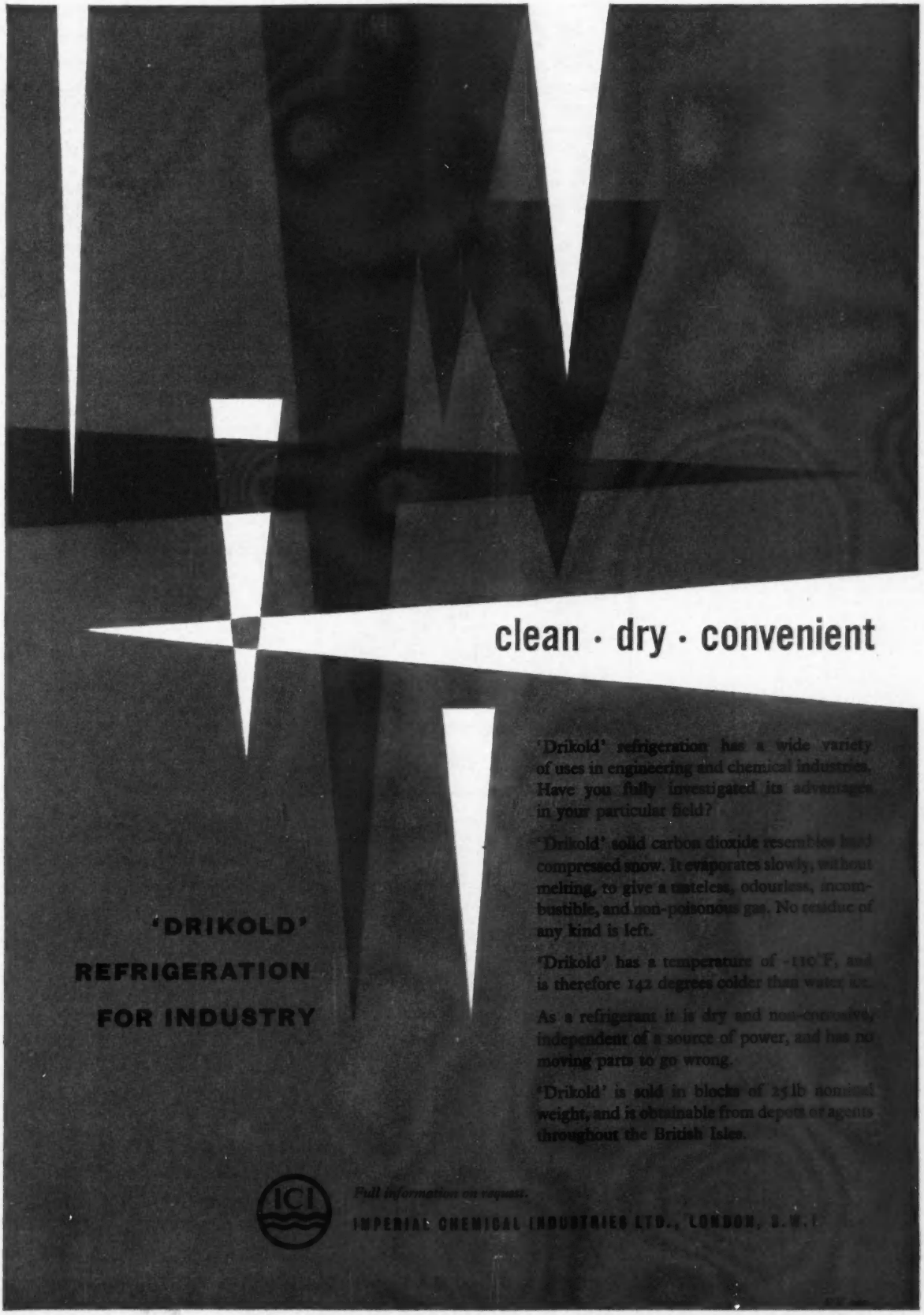
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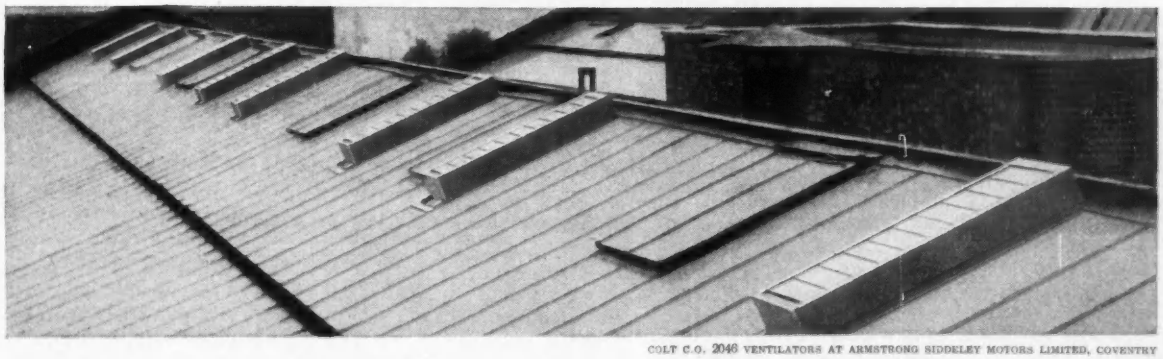

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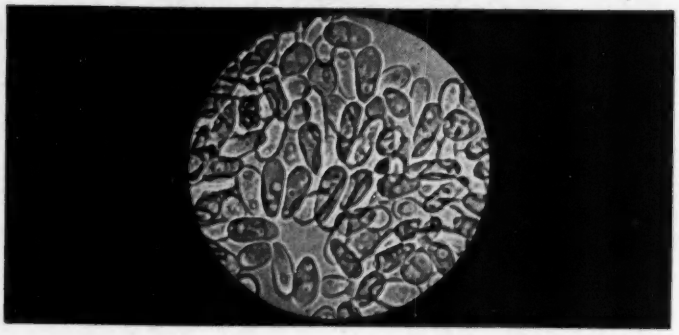

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CHEMICAL AGE

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SCIENCE AND HUMANISM

MUCH has been heard recently about science and the humanities. The Duke of Edinburgh opening the Manchester College of Technology, discussed the "so-called humanities." Last week, writing in *The Times*, Professor P. Mansell Jones, Professor Emeritus of Manchester University, dwelt on the "mortal peril" of the universities because of lack of humanistic teaching, and Sir Alexander Fleck, I.C.I. chairman, in giving the 5th Dunn Memorial Lecture on 25 May, chose to speak on 'Science and humanism: a background to citizenship.'

Professor Mansell Jones says that the majority of students leave the universities without having received any philosophical or moral guidance so that many might find it difficult to differentiate an ethical problem. "Science rapidly arms an increasing number of them with the instruments of production and research while the humanities, the 'so-called humanities' in the Duke of Edinburgh's phrase, risk losing their force as disciplines through failing to provide any sense of values other than those of highly specialised and often impracticable types of scholarship." The Duke, however, went further and pointed out that specialisation could ruin education in the arts as much as in the sciences.

The question Professor Mansell asks about humanistic teaching today is not whether there is too much of it but whether there is enough of the right kind. A university, he believes, is primarily a place for reflection and experiment, but "it provides no excuse for ultra-academicism supported by elaborate administration. Brilliant research, ingenious analysis, expert logomachy remain sterile for the education of the undergraduate, if they are not related, in some way that he can see, to any of the spiritual, moral or vital anxieties that disturb the phase of civilisation in which he has to live and work."

Today for the humanities, Sir Alexander indicates, we are back to the old idea of letters and the liberal arts, but these studies suffer gravely in having lost the scientific content of Renaissance humanism. Science on the other hand, if it has left the humanities, has seen a reverse process. He admits that "it is hardly fair today to expect a specialised work of science to be a great work of literature." Scientists, he feels, should take it as a pressing obligation to try to express themselves in lucid but elegant language, so endeavouring to strengthen the bonds of science and humanism. Also this would assist in "satisfying the wide and urgent interest among the general public in all scientific subjects."

The suggestion that scientists tend to be both lacking in humanity and incapable of appreciating the humanities, Sir Alexander rejects out of hand as a "piece of science-fiction," we are glad to note. He stresses that the scientist's empirical training makes him flexible in his approach to problems, including human problems. "Never before in the history of man has the scientist held such power for good or evil in his hands." He joins Professor Blackett in saying that what is of real importance now for world peace and stability is raising of living standards and hence purchasing power. Science and technology applied on a vast scale are required by underdeveloped countries, but of even greater interest to Sir Alexander as I.C.I. chairman,

is presumably the need of the highly industrialised countries, such as ours who depend for existence on trade, for science and technology to develop new products and processes "to replace the less complex primary and secondary industrial products whose manufacture our former trading partners have taken on for themselves."

The reluctance on the part of industrialists to conduct their businesses on a sound basis of science and technology is noted by Sir Alexander. For the last 25 years of the 19th century and for much of the 20th, he remarks, a sizeable part of British industry had tended to live on its accumulated technological capital without replenishing its reserves through extensive research into new products and new processes.

As chairman of I.C.I. Sir Alexander was recently asked during an interview with our U.S. contemporary, *Chemical and Engineering News* (1959, **37**, No. 16, 20 April, 98) what rate of increase in research spending he saw for I.C.I. for the next five years. To this Sir Alexander said that six years ago I.C.I. was spending £6 to £6.5 million a year for research. Today, I.C.I. were in the £12 to £12.5 million range. He stated "We are not sure at the present time as to whether or not that rate of increase will continue. We may have reached a point where we should fully exploit the results of research that we have gained so far—in other words, emphasise market development of products that possibly are already developed in the research laboratories." This statement is of interest since considering their size I.C.I. have produced few major new products from their own research. It is development research on discoveries made outside I.C.I. which has given the company a good number of its new products.

Cure for lack of research lies in the hands of industrialists, more so today even than in 1935 when Dr. J. T. Dunn, the inspiration of the Dunn Memorial Lecture, and Professor G. R. Clemo edited a series of reports for the Committee of Science and Industry. This report pointed out, Sir Alexander noted, that a community prospered best which made best use of its natural resources and facilities and this implied the best possible scientific direction of industry. In 1935 it was this scientific direction which had been found wanting.

. . . SCIENCE FOR PROSPERITY

Today we need science to create material prosperity for the community, but this prosperity will not enrich life without humanism, he suggests. The present age is seen by Professor Mansell Jones as one where the contributions made by the most practical type of science reinforce material equipment so that this era is known as the technological age. He is concerned, however, that the contemporary universities seem to forget that humanity lives by the heart "as well as by the leaps of the hypertrophied intellect." Sir Alexander points out, however, that in the U.S. where technical production is increasing faster than demand for technical products, the U.S. man or woman is already measuring up to the situation. U.S. women, for instance, released from much of household drudgery by scientific and technological inventions now occupy themselves intensively in civic and cultural activities and the sense of community and citizenship is strongly developed. With this in mind, the situation that Professor Mansell Jones fears, of more science in the Universities and hence of more scientists seen as single-minded fellows standing apart from the main stream, is unlikely to develop. Raising living standards and supporting economically and technologically the less fortunate peoples of the world will mean technical missions to design and construct factories and training of supervisory staff to operate and maintain them. Hence the 'exercise of world citizenship' as described by Sir Alexander should be foremost in encouraging science and humanism.

U.S. MARKET RESEARCH PREDICTIONS

'PRELUDE to the '60's' was the theme of the U.S. Chemical Market Research Association's 19th annual meeting, when chemical product markets were analysed.

Drug sales have continued to increase over more than two decades. The U.S. long range forecasters predict, however, that ethical drug sales should approach $1.9 billion by 1960, reach $2.7 billion by 1965 and pass the $5.5 billion mark in 1975. At present, antibiotics head the U.S. drug sales but there are hints that this group is reaching its maximum. Sales are expected to reach $390 million by 1960 and $513 by 1970, and for 1975, $600 million.

Tranquiliser sales are due to continue at high levels. If this type of drug can be used in mental illness, by 1962, sales could reach $316 million by 1965 and $800 million by 1975, suggests G. Stone of Chas. Pfizer's, J. B. Roerig division. After 1962, Stone also considers there will be effective treatments for heart disease, resulting in sales of $259 million by 1965 and more than $800 million by 1975. By 1962, Stone expects that there will be an effective cold vaccine. If this were so, vaccine and biological sales could reach $350 million by 1965 and be more than $400 million by 1975. And if there is a successful cancer treatment, sales of anti-cancer agents are estimated to reach $116 million by 1968 and at least $600 million by 1975.

In the chemical field, detergents, boron and industrial gases were spotlighted for continued growth. According to R. Macon, Atlantic Refining Corporation, detergents will continue to grow 'explosively'. This year synthetic detergents are expected to account for more than 73% of total U.S. soap and synthetic detergent sales. By 1965, it is suggested they will take 80% of this market—3.8 million lb. on an 'as sold' basis. Contributing to this rise are: development of better products, and improved washing machines; increasing population, new synthetics in toilet bars, and 'push-button' washing machines dispensing liquid detergents. Liquid detergents are already popular.

Boron chemicals are expected to continue their recent development. Borax production nearly doubled between 1950 and 1959 (as it did between 1936 and 1947). During the years 1959 and 1969, M. H. Pickard of U.S. Borax and Chemical expects sales to again double themselves. New civilian uses of boron chemicals could be as much a contributory factor to growth as high energy fuels.

In the industrial gases field a 12% growth is expected in the '60's for oxygen by Air Products. Good growth is also expected for argon, with prices slowly being reduced and new uses being developed for this gas. Hydrogen usage and production is expected to accelerate, as it is the cheapest reducing gas; and use of nitrogen will expand by virtue of developments in synthetic fibres, rocket fuels and other new uses, and expansion in agricultural demand.

NYLON RECLAMATION

RECLAMATION of nylon from used tyres using a new process developed by U.S. Rubber Reclaiming Co., will soon be operating on a pilot-plant scale, and by the middle of 1960, a full scale plant should be ready. According to U.S. Rubber Reclaiming, millions of pounds per year of high quality moulding-grade material will be provided at costs which will be "very attractive relative to the present price of virgin nylon".

Separation of the nylon-reinforced tyres is at present practised, the mechanically separated nylon fibre being chemically isolated and purified. The powder obtained is melted for moulding. As now obtained the powder is slightly grey in colour. Further purification is expected to yield a pure white powder if required. Heat from additional processing also darkens the powder further, although this can be masked by using appropriate colours. Work is also being done on the possibility of refilamenting the recovered nylon for various textile applications.

Hess Products Merge with Armour Chemical Division to Form New Company

HESS Products Ltd. and the Chemical Division of Armour Chemical Industries Ltd., have been merged under the name of Armour Hess Chemicals Ltd., of which half the share capital is controlled by Armour and Co., of Chicago, whilst the other half is controlled by U.K. interests, including a substantial proportion by Associated Chemical Co. Ltd. Hess Products were formed in 1946. and acquired the patent rights for the fractional distillation of fatty acids from Armour and Co., of Chicago, known under the trade name of Distec.

Since 1956 Hess Products have also manufactured the bulk of industrial chemicals which have been sold by Armour Chemical Industries. These chemicals are mainly cationic nitrogen derivatives of fatty acids and are used in the petroleum, road construction, paints, plastics, textiles, rubber, flotation and many other industries.

Integration of the production and selling organisations of the two companies, it is hoped, will benefit both British industry and the large export markets for these products. It should also lead to the most beneficial use of the combined resources in the companies research, development and customer service. Sales of industrial chemicals will continue to be made from 4 Chiswell Street, London E.C.1; tel. No. Metropolitan 0031. Sales office for Distec fatty acids will be at Brotherton Chambers, Leeds 1, tel. No. Leeds 35041.

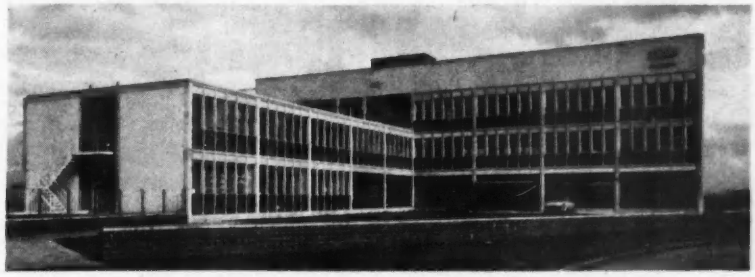
Reichhold to Extend Phthalic Anhydride Unit

EXISTING phthalic anhydride plant of Reichhold Chemicals is working satisfactorily and to cope with the increased requirements an expansion of the plant is under way and should come into operation by the end of October 1959. This was stated by Mr. Walter H. Breur, chairman of Reichhold Chemicals Ltd. in his annual report to shareholders. He added: "I would like to pay a tribute to our American, French and German associates for the able technical assistance they continue to render in this activity".

The Beck Koller Co. were, he said, again expanding their plant capacity to meet an increasing demand, particularly in the reinforced plastics field. It is expected that the development of new types of synthetic resins will again reflect an accelerated expansion.

The Vinyl and Vinatex companies continue to expand and now have 15 licensees producing their products overseas. New products have been added to the sales range and the research department is now developing additional types which are expected to assist in the expansion of sales in further industrial fields. (See also 'Commercial News'.)

Health Minister Opens Evans Medical New Research Block



New research laboratories of Evans Medical

COMPLETION of the new research laboratories at Speke, Liverpool, of Evans Medical Ltd., marks the culmination of a post-war development programme initiated in 1941 when construction of new works at Speke was started following the almost complete destruction by enemy action of the company's head office and works in Hanover Street and Seel Street, Liverpool.

Only approximately one-fifth of the site purchased some years ago to house new research laboratories has been developed in what the company's chairman, Mr. I. V. L. Fergusson, termed the initial phase I. The buildings now completed house general services designed to serve full development of the site, e.g. library, conference rooms, small animal breeding unit, as well as essential engineering installations. In the present building are housed the following departments: organic chemistry research, microbiology, pharmaceutical formulation, pharmacology, quality standards and control, biological standards and assay; also a suite of laboratories for special work which have not yet been equipped.

Bacteriology, immunology, virology and biochemistry departments are still housed at Evans Biological Institute, Runcorn, Cheshire; and all process research and some development research is still catered for within various production factories.

The new building will be concerned essentially with investigations of a fundamental long-term character with the scientific assessment of any promising products which emerge therefrom, and with pharmaceutical formulation research, for as the Minister of Health, Mr. Derek Walker-Smith, Q.C., M.P., emphasised when he opened these laboratories: "Research is vital to the progress of all industry: but to the chemical industry it is the very life blood." In particular, Mr. Walker-Smith said that price arrangements in the pharmaceutical industry must not deny adequate remuneration to companies active in research.

In this initial phase of research Evans Medical are to concentrate on synthetic organic compounds for future medical and pharmaceutical development. Unlike many U.S. companies, this section will not be using 'steam-roller' tactics, state Dr. C. W. J. Dyke, head of the department, and Dr. R. Bywood, who assists Dr. Dyke. They are interested in developing compounds of known activity which fulfil pharmaceutical requirements in physiologically defined fields.

Valuable assistance is being given to the organics department by Dr. C. W. King who is concerned with special analytical and assay investigations. Much in use in her section are a Sartorius-Werke semi-microbalance and a Stanton microbalance and a Unicam photoelectric quartz spectrophotometer.

Careful thought has been given to the balance room by the analytical staff and the architects to overcome vibration. The legs of the balance tables have been deeply imbedded in the concrete of the flooring while the table surfaces have foam rubber shock absorbers on all sides.

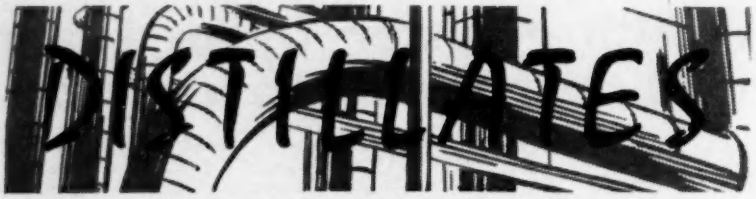
The pharmaceutical processing section is well equipped with modern apparatus. Particularly noteworthy were a glass climbing film evaporator and a glass cyclone evaporator. A micro-Kjeldahl apparatus appears to be much in use, as is an August Shuter, Ebingen, Wurtibg, infra-red moisture balance. This latter piece of equipment enables moisture contents of solids, e.g., granules, and high boiling point liquids to be measured directly.

In the quality control room, the emphasis is on improvement of vitamin assays and investigation of the stability of multivitamin products. Research assay work is continuing on Evans Medical's recently introduced Ebimar.

Census Production Figures for U.K. Chemicals Published

The following sections of the report on the Census of Production 1955, 1956, and 1957 for the chemical industry have now been published, and copies are obtainable from H.M.S.O. at York House, Kingsway, London W.2, and branches, or any bookseller.

Volume I, price 2s., contains tables relating to standard industrial classification orders III (treatment of non-metalliferous mining products other than coal), IV (chemicals and allied trades), V (metal manufacture and for selected industries within these orders).



★ First stage in the development of Monsanto Chemicals' 114-acre site at Fawley is the factory and polythene plant built at a cost of about £3.25 million with a capacity of 10,000 tons a year. The polythene plant has a control panel described as a "masterpiece of electronic engineering". It is said to be so complex that it took about 8,000 man-hours to install and wire-up; it provides automatic control of every stage of the process.

The plant has been designed to work non-stop 24 hours a day with a total staff, divided among three shifts, of about 220 people, including 25 scientists and engineers. Capital per employee involved at Fawley is about £15,000 per head, compared with an average of £4,000 per employee for the Monsanto factories at Ruabon and Newport.

Control and checking apparatus of a pilot plant is even more delicate and complex than the main plant controls, of which it is a miniature, because with its aid methods are being sought to make still further improvements in the production of polythene and to produce a product with an even wider range of uses.

There is no industrial waste at Fawley. Any of the polythene gas not converted into polythene in the process is recycled through the pipelines.

★ At the opening of Evans Medical Limited's new research laboratories (see p. 925), the chairman, Mr. I. V. L. Fergusson stated that apart from fundamental and applied research now being started up on a greater scale there, considerable attention has been and is continuing to be given in manufacturing sections to process research. The Minister of Health, Mr. Derek Walker-Smith who opened the new laboratories is, of course, particularly interested in the results of such work, since it is by the improvement of yields and of labour utilisation that costs can be reduced and hence the burden of the Drug Bill on the National Health Service reduced.

Mr. Fergusson stressed that the manufacturer and wholesaler receive less than 7% of the total cost of the National Health Service, so that any saving in the Drug Bill is not in itself going to transform the cost of the Health Service.

To shareholders of the company, many of whom were present at the official opening, Mr. Fergusson made it clear that there could be no guarantee, either as to time or as to amount, as to what reward might be reaped from the company's investment in research. He pointed out that in this period of great scientific advancement no pharmaceutical manufacturer could afford *not* to engage in research to the maximum extent his resources, and that normally means his profits, permit. "If he doesn't he will surely fail." He added: "Unfortunately it would be untrue to say that if he does he will surely succeed."

★ More p.v.c. is produced in Britain today than any other plastics material. At 100,000 tons a year p.v.c. represents one quarter of the total annual British plastics production (400,000). The important part now played by p.v.c in every walk of life is the theme of 'The Geon Story', a lavishly illustrated publication recently issued by British Geon Ltd., one of the D.C.L. Group.

In over 40 pages, and with the aid of more than 80 photographs, the story of Geon p.v.c. and its many uses is told. The growing importance of rigid p.v.c. in chemical engineering is discussed in a special section devoted to the use of this material in the fabrication of all types of chemical plant and equipment and in the production of piping for water mains, gas lines and effluent disposal systems, where the corrosion resistance of p.v.c. is an important advantage over other materials.

There is also a brief description of the processes whereby p.v.c. is made, as well as diagrams explaining the principal processes by which p.v.c. is converted into end products. Copies of 'the Geon Story' are available free from British Geon's Information Department, at Devonshire House, Piccadilly, London W.1.

★ Something of the story of I.C.I.'s discoveries and developments and of the immense efforts which have made them possible is told on the company's stand at the British Trade Fair in Lisbon. This story is told against a background of historical reference to the achievements of Britain's men of science. One section of the stand is a picture gallery of these great scientists—from Robert Boyle (1627 to 1691) to Sir Alexander Fleming (1881 to 1955), the discoverer of penicillin.

The scope of I.C.I.'s activities today can be judged by the fact that the company produces over 12,000 products in 100 factories throughout Great Britain. Behind this immense production effort are the programmes of research and development on which the company last year spent over £15 million. Of the 112,000 employees, 6,000 are qualified chemists, physicists and engineers.

I.C.I.'s already extensive overseas interests are constantly developing through a network of subsidiary and associated companies in 45 countries. In all the remaining countries of the world the company is represented by agents. These companies and agents handle I.C.I.'s growing exports, currently running at £73 million. In 1958 I.C.I. exported goods worth £23 million to Europe alone.

Individual exhibits on the Lisbon stand give information on the products of the Fibres, Pharmaceuticals, Plastics, Metals, Nickel, Dyestuffs and Billingham Divisions.

★ Among materials to be shown for the first time at the International Plastics Exhibition in Dusseldorf in October will be a range of polycarbonates. These polyesters with thermoplastic properties are chiefly notable for the wide temperature range over which they can be used. They are heat-resistant up to 135°C and cold-resistant down to −100° C. In addition they have a good resistance to acids. It is now possible to produce polycarbonates as transparent material.

Also to be shown at Dusseldorf will be a group of new p v.c. polyblends, a range of plastics consisting of mixtures of p.v.c. and chlorinated polythenes produced as hard, impact-resistant and as soft, flexible types. It has proved possible to achieve the good dielectric properties of hard p.v.c. with materials that are flexible without having plasticisers added to them. Their temperature range—from −40°C to 85°C—is said to be much greater than plasticised p.v.c.

★ Although the chemical industry has had a long period of relatively trouble-free relations with labour in the industry, there have been a number of black spots. Nearly every major instance of strike action, go-slow or overtime ban in recent years has occurred in construction gangs.

Building of Shell Chemical's Nitra-Shell facilities at Shell Haven, for instance, was plagued with labour troubles and at the recent opening ceremony (see Chemical Age last week) Mr. F. A. C. Guepin, chairman of the company and a managing director of the Royal Dutch-Shell Group, referred to the physical difficulties which face chemical producers when constructing a major plant.

He said he would have liked to be able to say that the work of constructing the plant had been carried out without industrial disputes of any kind. Unfortunately this was not so. It caused trade union leaders involved as much anxiety as it did Shell Chemical, and because of the delays involved, it also affected budgeting, costing and marketing.

This kind of labour trouble is particularly noticeable in the closing stages of construction, when the men try to make the job last as long as possible. Although Shell Chemical have plenty of room for further expansion at Shell Haven, they must have serious apprehensions about further building on a site that has seen so much trouble already.

Alembic

Birthday Tribute to Victor Blagden

G.O.M. of Merchant Trade Celebrates 92nd Birthday

DOYEN of chemical merchants, Mr. Victor Blagden celebrated his 92nd birthday on Friday, 29 May. For most of his working life, Mr. Blagden has played a prominent part in the affairs of the merchant trade, having spent 27 years as president of the British Chemical and Dyestuffs Traders' Association when he relinquished that office in 1949.

Although he could not attend the annual luncheon in London last week, he continues to take a keen interest in the association's affairs.

In the offices of the British Chemical and Dyestuffs Traders' Association in Westminster Palace Gardens, London, S.W.1, hangs a portrait of Mr. Blagden, painted to mark his completion of 21 years as president of the association in 1944.

The portrait, by Maurice Codner, a president of the Royal Society of Portrait Painters, was presented to Mr. Blagden by members. Up to that point he had been the association's only president after playing the leading part in founding it.

The presentation was made at the Savoy Hotel, London, on 16 May 1944, when Mr. Blagden was 13 days short of his 77th birthday.

In 1923 the British Chemical and Dyestuffs Traders' Association was founded through a merger of the British Chemical Trade Association and the Chemical and Dyestuffs Traders' Association. The first was founded in March 1918 and the second in 1920.

Respected by Both Sides

The merger was encouraged by the Board of Trade and Mr. Blagden was looked to as the man, respected by both sides, who could bring it about. No man was more highly regarded in the trade. He was held in esteem for his business ability and affection for his personal qualities.

At the end of the first world war he was chairman of a vigilance committee of the London Chamber of Commerce and his experience of controls and the working of government departments in that capacity was of great value in his later activities.

The association was born of necessity when the passing of the Safeguarding of Industries Act in 1921 was followed by protection of British industries. Associations speaking collectively became necessary in many industries to smooth the operation of new measures, and to interpret the Government's intentions as well as putting forward interests of members to the Government.

As British trade and industry became more and more affected by government action the importance of the association grew. In the second world war with a mass of controls and regulations to deal with the association became an information bureau, being of great value to its members on the one side and the Ministry of Supply and other government departments on the other.

Mr. Blagden, a widower, lives in a flat in the West End of London. Until recently he made regular crossings of the Atlantic to see his granddaughter in the U.S.

Victor Blagden, from the portrait by Maurice Codner

Mr. Blagden was born in 1867 and after education at Dulwich College and on the Continent worked for two or three years in an important German chemical factory.

In 1892 he joined his father in partnership, which was dissolved in 1896 when his father joined the Gas Light and Coke Co. He then started Blagden, Waugh and Co., in conjunction with the late W. Waugh, and with Burt, Boulton and Haywood Ltd., founded the Dominion Tar and Chemical Co. of Montreal.

In 1918, Blagden, Waugh and Co. was dissolved and Victor Blagden and Co. was formed, with offices in Lloyds Avenue in the City of London. They moved to Plantation House, London E.C.3, and were bombed out during the war, but are now back in the rebuilt building. Mr. Blagden retired from the chairmanship in 1949, but continues to take an active interest in its working.

His son, Mr. C. F. V. Blagden, is a former chairman of the association and a director of Victor Blagden and Co. Ltd.

The present chairman of Victor Blagden is Mr. A. J. Lush, who has been 40 years with the company.

Victor Blagden and Co. have developed from their original interest in chemical merchanting until they now have one of the largest drum manufacturing and reconditioning businesses in the country, turning out a million drums a year.

Observation of the effect on drums of the type of handling they often receive, combined with their specialised knowledge of industrial chemistry, enabled Victor Blagden's to develop processes for cleaning drums and to offer a scientific reconditioning service.

Drums are often dumped on surfaces of ash and cinders, which results in chemical action being set up between the acid in the ashes and the steel of the drum. The complete removal of residues and oxidised wastes calls for skilled treatment to make sure that the drums are fit for re-use.

Internal rusting through bungs being left off and damage through rough handling are among the other hazards that have to be dealt with.

Every firm gets its own drums back.

Victor Blagden's plant at Trafford Park, Manchester, is believed to be the biggest of its kind anywhere. In designing it they called on their experience at their Barking, Essex, works.

Major Cuts in I.C.I. Wrought Titanium Prices

THE largest reductions so far made in the price of British wrought titanium products were announced on Monday by I.C.I. Metals Division. The heaviest cuts are in prices for sheet, strip, plate and wire, which are reduced by 25%. Rod and billet prices are cut by 15%, and extrusions (latest addition to the range of I.C.I. wrought titanium products) by 12½%.

These reductions—the second in 12 months—bring the price of I.C.I. wrought titanium to less than half the level operating in 1955, when the company started commercial production.

Sheet (commercial purity), 8 ft. by 2 ft. by 20 gauge is reduced from 111s per lb. to 85s; rod 1 in. diameter, from 77s per lb. to 66s; and extrusions from 120s per lb. to 105s.

Present U.K. production of titanium is estimated to be 250-300 tons a year. In the U.S. where titanium has made a substantial recovery recently the industry is understood to be operating somewhere near its capacity of 20,000 tons/year.

I.C.I. to Cut Nitrogen Prices by 3%

AS FROM 1 July, Imperial Chemical Industries Ltd. announce, the price of sulphate of ammonia manufactured by members of the British Sulphate of Ammonia Federation will be reduced by 3%.

Price per ton before deduction of the fertiliser subsidy will be £19 17s. or 11s. lower than last July, and the guaranteed nitrogen content of sulphate of ammonia will be increased from 20.8% to 21%. After July, however, until the peak demand period the following March, there will be monthly increases in price up to £21 5s. per ton, a figure 3s. lower than the current quotation.

I.C.I. also announce that the price of their Nitra-Chalk Twenty-One is reduced from £24 8s. 6d. to £24. Prices of Nitra-Chalk Fifteen-Five, Concentrated Complete Fertiliser (C.C.F.) and Kaynitro will remain unchanged.

New Theories of Polymer Degradation

Development Work Described in Annual Report of A. D. Little Institute

FURTHER work has been carried out by Dr. Manfred Gordon and his three colleagues at the Arthur D. Little Research Institute, Inveresk, Midlothian, Scotland, on the mechanism and kinetics of the formation of isotactic polymers and the polymerisation of various monomers such as styrene, 4-methylpentene-1 and 2-chloroprene, with heterogeneous or homogeneous catalysts of the anionic type have been investigated, the Institute's second annual report indicates.

Heterogeneous Ziegler catalysts have been prepared from aluminium alkyls and titanium trichloride, while boron triethyl has been made for homogeneous anionic catalysis. Kinetic analysis of such processes is still in the early stages of development. Methods have been devised for following the reactions under either flow conditions or stationary conditions. Study on the sorption and desorption rates and equilibria of the polymer formed on the catalytic surface of the catalyst bed are stated to be beset with appreciable experimental difficulty.

Polymerisation Reaction

To attempt to follow the polymerisation reaction kinetically a flow apparatus has been developed. Ultimately it is hoped to use it to polymerise different monomers using the same catalyst sample and so obviate the need to produce identical catalyst samples for each experiment. The catalyst used is based on titanium trichloride and aluminium triisobutyl. It is prepared *in situ*. The titanium salt is deposited on silica of high specific surface and this, in turn, is supported in the reaction chamber on a sintered glass disc. The catalyst is then prepared by passing aluminium triisobutyl through this bed.

Various monomer solutions have been passed through the catalyst bed thus prepared and the rate of reaction measured by the heat of polymerisation liberated. This heat causes a rise in temperature of the reactants of about 0.03°C and this is measured using thermistors in a Wheatstone bridge circuit.

Flow experiments so far performed, using 4-methylpentene-1, show that with either heptane or benzene at 40°C as solvent the polymer is deposited in the catalyst bed as it is formed. Similar results have been obtained using styrene with either decalin or toluene at 80°C. With decalin temperatures up to 150°C were ineffective in dissolving the polymer.

These results indicate that crystalline polystyrene is formed in the catalyst bed; such crystalline material, Gordon and his co-workers indicate, would only dissolve in very good solvents or at high temperatures. So that higher polymer desorption rates may be obtained an improved apparatus is now being constructed.

Dilatometry. In dilatometry experiments, styrene has been polymerised using a Ziegler catalyst in stirred dilatometers. The variable initial rates observed by other workers have occurred. The length of time required to attain a constant rate appears, state Gordon *et al.*, to increase as the catalyst concentration is decreased. From complete rate curves now accumulating, it is hoped to obtain some clues as to the mechanism of the reaction.

Polymerisation of 2-chloroprene has been attempted in order to find whether Cl or CH_3 groups are replaceable on a crystal lattice. This work has been initiated for the following reason. Rubber hydrochloride is known to be crystalline and the explanation for this crystallinity may be, it is suggested, that it has a regular tactic structure, or that Cl and CH_3 groups are interchangeable on the crystal lattice. If the former is true, the report says, facticity would have been achieved in a reaction other than propagation.

Radical catalysts would be expected to produce an atactic polymer of 2-chloroprene; if this polymer is crystalline it would suggest that Cl and CH_3 are replacable. Various initiators have been tried together with a wide variation of experimental conditions. Under no circumstances has a high molecular weight product resulted and the polymer has shown rapid oxidation.

Viscosity Measurements

Viscodensitometer. For studying packing aspects of polymer solutions in terms of viscosity and partial specific volumes, a new viscodensitometer, based on a novel principle has been devised. The instrument is stated to be more sensitive than that described by Gordon and Grieveson, and to give absolute results rather than measuring changes.

Two hollow Pyrex glass spheres (0.8 mm. dia.) are used in the solution to be measured. These spheres are first carefully etched in hydrofluoric acid to adjust their apparent densities to about $d + 0.0001$ and $d + 0.0008$ gm./cm. where d is density of the solution. Thus from the measured rates of travel of the two spheres, both the viscosity and the densities of the solution can be found. After preliminary calibration, it is reported, densities can be measured to about $\pm 0.000{,}001$ gm./c.c. in 30 minutes; using only 3 ml. of solution. Viscosities are measured to 0.5% or better.

Polymer morphology. Two new developments in evaluation of physical properties of polymers are reported. Samples of isotactic poly-(4-methylpentene-1) prepared in higher crystallinity than reported by previous workers have been supplied to Mr. A. Keller of Bristol University who has been successful in growing from them single crystals suitable for electron microscope and electron diffraction studies. He has determined the unit cell to be tetragonal 18.5Å × 13.85Å. Each unit cell is made up of 4 helices; each of 7 monomer units of length.

Corrosion. A five-man team under Dr. P. Hersch is studying the chemical and physical phenomena at metal surfaces and the effect of organic inhibitors. Over 100 organic compounds have been screened as inhibitors for mild steel and preliminary attempts have been made to correlate structure and inhibitory power. The survey has shown that although large molecules are very often good inhibitors a high molecular weight is not an essential condition for an additive to be effective. While attachment of the carboxylate group to an aromatic ring can convert an inert substance into an inhibitor, introduction of the same group into an aliphatic amine, on the contrary, was found to destroy the inhibitive property of the amine in a number of instances.

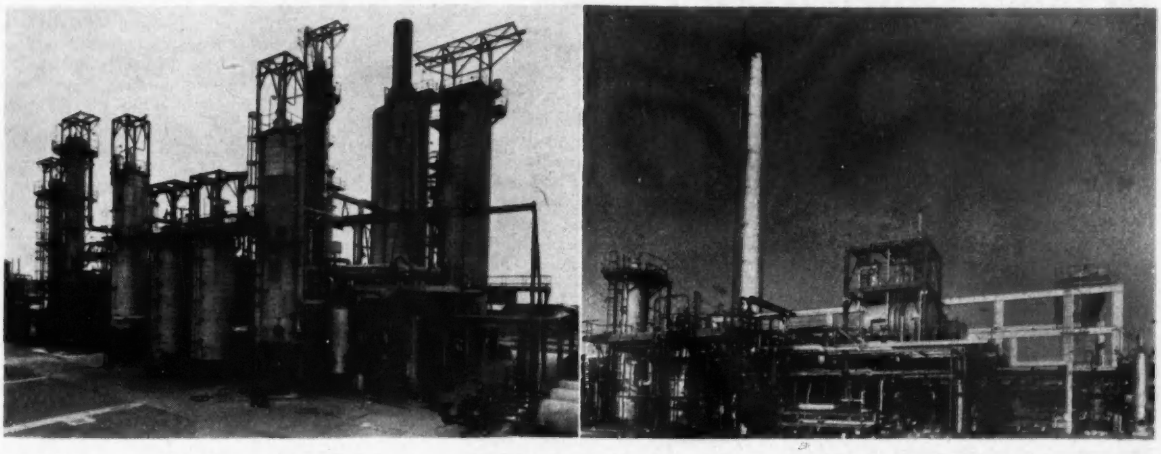
Anodic Mechanism

Present evidence suggests a predominantly anodic mechanism of inhibition in neutral aerated medium. In several instances, it has been found that conventional inhibitors for rusting also prevent attack of steel by neutral solutions of complexants. It has also been found that when steel was forced to corrode in a complexant medium through the impression of oxidising potential, and the currents obtained were plotted as a function of potential, the curves were greatly affected by addition of inhibitors, just as they were when the corrosive process resulted in rust, in the absence of complexant. This indicates, the Institute researchers state, that the actual step which is inhibited is the detachment of the metal ion from the metal lattice and not any event in the further fate of the ion, such as hydration, complexing, or precipitation.

A technique has been developed whereby, for the first time, the action of an additive on rate of corrosion can be observed almost instantly.

Polymers from sucrates. The report also describes developments in the preparation of new sucrose derivatives, using alkali metal derivatives as intermediates under Drs. W. A. P. Black and E. T. Dewar. Stable sodium sucrates up to the heptrasodium derivative have been prepared from sodium amide in liquid ammonia and condensed with a variety of organic halogen compounds and acid anhydrides to give a series of sucrose ethers and esters. Highly cross-linked polymers of the epoxide resin type are obtained from reaction of mono-, tri-, penta- and heptasodium sucrate with epichlorhydrin which are insoluble in water and organic solvents.

SYNTHESIS GAS FACILITIES AT SHELL-HAVEN



Synthesis gas purification section, during construction (left), of the Shell Haven facilities opened recently by the Duke of Northumberland for Shell Chemical Co. Ltd. (see 'Chemical Age' last week, p. 889). Shown on the right is the pressure oil-gasification plant. These units were described last week

Geigy's Triaryl Phosphates as Fluids and Oil Additives

IT is in problems where boundary lubrication occurs that aryl phosphates are used as additive materials to prevent metal-to-metal contact, and to enable heavier loads to be carried without a corresponding increase in wear. Where loading of lubricated surfaces is such that the lubricant film is broken, compounds which will react chemically with, or be physically absorbed on to, the metal surfaces involved are used. Such compounds, known as extreme pressure additives, allow higher loads to be carried by bearing surfaces.

Use of compositions containing phosphorus in extreme pressure applications is well established. According to current theories, phosphorus which is available at heavily loaded metal interfaces forms a metal phosphide which then alloys with the metal surface under conditions of high temperature and pressure.

Tritolyl phosphate as an anti-wear agent in a series of synthetic diester lubricants has been investigated. The phosphate proved effective over a wide range of temperatures and it was apparent that it greatly improved wear-reducing properties of di-2-ethylhexyl sebacate. Similar results were obtained with varying concentrations of tritolyl phosphate in bis-1H,1H,7H,dodecafluoroheptyl, 3-methyl glutarate for hard steel on hard steel. Other investigations have shown that wear properties of compositions of mineral oil or diester lubricants containing tritolyl phosphate are adequate at high temperatures.

In addition to extreme pressure effectivity studies have shown that aryl phosphates perform the concomitant function of lowering frictional coefficients at high temperatures and low sliding velocities.

Published literature shows that when di-2-ethyl hexyl sebacate containing no additive except an oxidation inhibitor is studied in an endurance test using a ball-bearing mounted on a spindle, the length of the test was a 'mere 48 hours'. With addition of tritolyl phosphate, the time to failure was greater than 1,000 hours.

The value of 1% tritolyl phosphate in preventing scuffing of heavily-loaded metal surfaces under conditions where corrosion is maintained at a minimum value has been substantiated in a series of experiments. Results have suggested that aryl phosphates can be used during the running in period of new engines and it is known that the addition of small quantities of tritolyl phosphate (less than 5% by weight) to motor oils can materially assist in removal of 'high spots' particularly on cylinder walls by chemical polishing and conferring a degree of extreme pressure resistance on the lubricant.

From the patent literature, aryl phosphates are noted as being useful in a wide variety of organic and organo-metallic compositions and to perform as well in diesters, carbonates, silicon-based compositions, polyglycols, etc., as they do in mineral oils. They have proved to be effective anti-wear agents in liquid lubricants as well as greases and to lubricate satisfactorily in bulk as the prime functional fluid.

Claims have been made in patent literature that the aryl phosphates reduce corrosion of lubricant compositions in contact with a variety of metals. In straight (non-aqueous) and soluble (emulsifiable) cutting oils, triaryl phosphates prolong tool life. To control pre-ignition tritolyl phosphate has proved effective.

A major consideration in present-day hydraulic systems is the flammability of fluid for hydraulic applications. The aryl phosphates have proved to have excellent fire-retarding properties and do not readily support combustion even when sprayed on to a heated metal surface. Blended with conventional hydraulic fluids, the aryl phosphates improve fire retarding properties of the base fluid and improve the lubricity of the final product. Tritolyl phosphate, used continuously at 300°F has shown good resistance to oxidation. It is also hydrolytically stable and does not break down when exposed to atmospheric moisture at high temperatures.

Some plasticising and solvent action is shown by the aryl phosphates for most synthetic and some natural high polymers. This presents a problem since packings and seals are normally manufactured from rubber and these swell in contact with the phosphate fluid. Packing materials available which are resistant to the phosphate fluids, are butyl rubber, polytetrafluoroethylene, Kel-F, nylon, polythene, silicone rubber, with the possibility of Thiokol and natural rubber (temperature below 100°C). The same consideration applies to choice of paint for use on external parts, since many paints are stripped by the phosphate.

Triaryl phosphates are manufactured by Geigy Co. Ltd., Rhodes, Middleton, Manchester. Most of the work indicated above has been carried out with tritolyl phosphate, but in many applications this can be replaced by either triphenyl phosphate or trixylyl phosphate.

Lead for T.E.L. in 1958

U.K. consumption of lead for tetraethyl lead in 1958 totalled 20,131 long tons, compared with 21,342 in the previous year. Battery oxides accounted for 26,076 long tons of lead last year, against 25,112 in the year 1957, and white lead for 8,892 long tons of lead compared with 9,622 in 1957.

BISRA Completes Work on Process to Bond Callendered P.V.C. Film to Steel Sheet and Strip

OF the 228 research projects in progress at the British Iron and Steel Research Association (BISRA), a few were of particular topical interest, the 15th annual report of the Council shows.

The Iron-making Division has brought its process (previously known as the Cyclosteel process, now referred to as flame smelting) to the point where quantities of molten metal free from slag can be tapped. The chemistry department is reported as having had highly encouraging results in a works trial of a new suspension system for the roofs of basic open-hearth furnaces which is designed to reduce the losses of cracked ends of bricks. Radioactive isotopes are being used as tracers in the study of diffusion and mixing in the slag layer and colorimetric, spectrographic and polarographic methods are reported as showing promise in new fields.

Development of the Plasteel process for bonding callendered p.v.c. film to steel sheet or strip has been completed. Four British companies are now building production plants. A pilot plant built by one of these companies has been in operation for some time, and production plant built by another is nearly ready to be commissioned. A licence has been granted to a Commonwealth BISRA member and four others are considering licence applications.

P.V.C. Film on Tinplate

A large quantity of tinplate has been coated with p.v.c. film on a pilot plant scale. This application is being developed in conjunction with a container manufacturer. Research is also being directed to making plastics-coated steel by using a liquid plastisol, composed of p.v.c. polymer, plasticiser and stabiliser, instead of a callendered film. This promises to be cheaper than the Plasteel process and to be well suited for products made from thinly-coated light-gauge steel finished in a single colour.

Research is being carried out by BISRA to improve existing methods of applying and curing lacquers, which are unsatisfactory for applying thin coatings to strip at high speeds. A strip-lacquering process is being developed that uses electrophoresis as a means of applying the lacquer. The process is stated to resemble electroplating, but a liquid suspension of finely divided solid coating material forms the electrolyte. Particles are deposited, rather than ions as in electroplating, and consequently the quantity deposited per coulomb is many times greater. An experimental strip-coating line has been built for coating strip 1 in. wide at 30 ft./min. with an epoxy-phenolic resin in aqueous suspension. After application the coating is dried and heat-treated to cure it and to make a good bond with the steel. Good coatings 0.001 in. thick have been obtained.

A new series of tests on priming paints for sprayed zinc and sprayed aluminium coatings on steel has been started at two new corrosion-testing sites, one in an industrial atmosphere at Stratford, London, and the other at Pilsey Island, Sussex, where conditions are marine.

Specimens sprayed with aluminium paint and then painted lasted very well in the severely corrosive, tropical climate in Nigeria. Long-term investigations on metal coatings and priming paints for bare steel when exposed to atmospheres such as Brixham and Derby are still in progress. Coatings of iron-zinc alloy 0.5 mil. thick failed after three years; tests on thicker coatings are continuing. Some alloys containing 60 to 70% zinc have resisted corrosion better than pure zinc, although a tendency to rust-stain detracts to some extent from their appearance.

Preliminary tests on inhibition of corrosion by sodium silicate have been completed. Experience has led to modifications in the test apparatus so that more uniform exposure conditions are obtained.

Other work has included tests on phosphate coatings and phosphoric acid washes. An instrument has been developed for removing by abrasion small amounts of phosphate coating; the amount of phosphate thus removed is found by analysis, from which the thickness of the phosphate coating can be calculated. Coated cast-iron pipes, buried for five years at Benfleet, Brill and Pitsea have been removed. The thicker coatings were found to be in excellent condition.

Natural Rubber Compounds Can Now be Used at 100° to 150°C

USAGE of natural rubber compounds can now be extended to include products for service at temperatures of the order of 100° to 150°C—as the result of research work carried out by the British Rubber Producers' Research Association. Full details of the compounding methods and ingredients, together with test results, are given in B.R.P.R.A. Technical Bulletin No. 3, 'Compounding natural rubber for heat resistance', published by the Natural Rubber Development Board, Market Buildings, Mark Lane, London E.C.3.

Improvement in heat resistance is brought about by careful selection of curing systems, protective agents and fillers. The tests described were carried out on laboratory test-pieces but it is stated that far longer service lives may be anticipated for many rubber components which present a proportionately smaller area for oxidative attack.

Heat-resistant compounds are suitable for a very wide range of products and applications for which mixes are suggested include conveyor belts, steam hose, mountings, flexible couplings, seals, gaskets, thread, grommets, cables, lagging and sheeting, diaphragms and stoppers.

The basic techniques used in compounding natural rubber for maximum life at high temperatures are stated to be: 1. Use of a 'sulphurless' curing system; even very small proportions of elemental sulphur give inferior ageing. 2. Use of an antioxidant conferring high heat-resistance. 3. Use of dithiocarbamate as a protective agent; this is often formed *in situ* during vulcanisation. 4. Use in some cases of an antioxidant of the type sometimes known as 'deactuator'. 5. Selection of an appropriate filler.

Effect of high temperature ageing upon the following properties has been examined: tensile strength and elongation at break measured at 20°C and 100°C; modulus measured at 20°C and 100°C; and resistance to compression set.

Stocks are recommended for applications where these groups of properties in turn are of prime importance and also where various combinations of these properties are required for a number of specialised applications.

In retention of tensile strength and elongation at break at 20°C, compound A1 (FEF/Zn0) is suggested for applications such as grommets, cables, lagging, sheeting. Protection against ageing is given by Flectol H polymerised trimethyl (dihydroquinoline), ZMBI (zinc mercaptobenzimidazole) and ZDC (zinc diethyldithiocarbamate) plus the dithiocarbamate formed from the tetramethylthiuram disulphide during vulcanisation. A mixture of carbon black and zinc oxide is used as filler.

In compound A2 substitution of the black/zinc oxide filler by a silica such as Fransil is stated to improve initial TS and EB but gives poorer ageing. For retention of TS and EB measured at 100°C where the vulcanisate is likely to be stressed at high temperatures (e.g. in some conveyor belts) a wholly black filler such as FEF or HAF is recommended for applications such as flexible couplings and mountings where constant modulus is most important, tetramethylthiurum disulphide (TMT) Tellurium curing system is replaced by TMT alone in compound C1. The black/zinc oxide filler combination is stated to be preferable.

To improve resistance to set the deactivator can be omitted from compound D1, but to compensate for the effect of its omission on ageing Agerite White is added (ditetranaphthyl-p-phenylenediamine). A wholly black filler is preferred. Where tensile retention of D1 is inadequate a fully protected highly cross-linked diamyl peroxide stock can be used.

NORRISH OUTLINES RECENT FLASH PHOTOLYSIS RESULTS

R.I.C. London Section Meeting

THE technique by which studies had been made of the production of free radicals when gases are exposed to a flash of light dissipating 1,000 to 10,000 joules in about 100 micro-seconds, was outlined by Professor R. G. W. Norrish recently in a lecture on some recent results obtained by the method of flash photolysis. Professor Norrish gave the lecture to members of the Royal Institute of Chemistry, London Section at the British Coal Utilisation Research Association.

The flash (the photoflash) is applied by a lamp parallel and very close to a reaction tube and is followed by a second flash (the spectroflash) from another lamp arranged to send a beam of light along the length of the reaction tube. The lamp giving the spectroflash is triggered by an electronic timer initiated photoelectrically by the photoflash and preset to give a series of flashes at intervals ranging from 10^{-5} to 1 second. By studying successive photographs of the absorption spectra of the contents of the reaction vessel taken at increasing intervals the production and decay of free radicals can be observed.

Under adiabatic conditions instantaneous temperatures of several thousands of degrees Centigrade are generated and thermal 'cracking' occurs. Conditions can be made practically isothermal, however, by the presence of a relatively large amount of inert gas (or an inert solvent) to act as coolant, and by reducing the pressure of the reactant. Professor Norrish dealt first with flash photolysis under isothermal conditions.

After mentioning briefly some work on the search for evidence of the elusive HO_2 radical, Professor Norrish dealt with the flash photolysis of $C10_2$, in which excited O_2 molecules which were very hot vibrationally but at room temperature rotationally and translationarily were produced

$$C10_2 + h = C10 + O$$
$$O + C10_2 = C10 + O_2^*$$

The excited oxygen molecule (O_2^*) contained as much as 7-8 quanta of vibration; this corresponds to about 30 kcal/mole.

Similar excited molecules or radicals were produced by flash photolysis of other substances, the typical reaction being:—

$$ABC + D = AB + CD^*$$

in which a large measure of the exothermic heat of reaction appears as energy of vibration in the newly formed bond. Examples quoted were:—

$$O_3 + O = O_2 + O_2^*$$
$$C10_2 + O = C10 + O_2^*$$
$$NO_2 + O = NO + O_2^*$$
$$O_3 + C1 = O_2 + C10^*$$
$$O_3 + Br = O_2 + BrO^*$$
$$O_3 + H = O_2 + HO^*$$

The photolysis of pure and diluted ozone, in the light of the above principle, was discussed and it was shown how flash photolysis gave a consistent explanation of the very different mechanisms of the 'dry' and 'wet' decompositions.

Professor Norrish then dealt with studies made under adiabatic conditions. When SO_2 was flashed, the typical spectrum disappeared for several milliseconds, and a labile form was produced thermally, which by photolysis gave SO radicals:—

$$SO_2 + \text{heat (adiabatic)} = SO_2 \text{ (labile)}$$
$$SO_2 \text{ (labile)} + h = SO + O$$
$$O + SO2 = SO + SO$$

This method had been used for the study of explosive reactions and thence to investigate the mechanisms of knocking and the behaviour of anti-knock compounds. There was evidence that the action of an anti-knock took place in the gaseous phase and not, as previously believed, on the surface of carbon particles or on the cylinder walls. The sequence of events based on gaseous PhO formed during the 'pre-flame' reaction anticedent to the explosion was demonstrated.

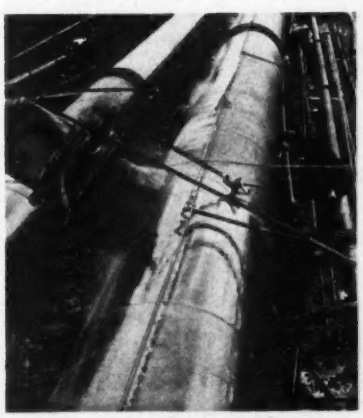
Professor Norrish made a brief reference to the use of flash photolysis for studying materials in the liquid state, mentioning particularly the work of Porter on the triplet state of pyrene anthracene, etc.

Power Station Now Operating on Gas Produced in Newman Spinney Seam

A 3.75 MW power station is operating from gas produced at the underground gasification project developed by Humphreys and Glasgow, Ltd., for the National Coal Board at Newman Spinney, near Chesterfield, work on which is due to end on 30 June. The National Coal Board has decided that further expenditure on it is not justified as far as the fuel needs of the country are concerned.

An entirely new system is being used. A shaft was sunk to the coal seam and a gallery driven horizontally. From this gallery boreholes were drilled within the coal seam for distances up to 450 ft. The drilling of these boreholes itself represents a considerable achievement, since the seam is only some 27 in. thick and the holes are 14 in. in diameter. Vertical holes were drilled from the surface to intersect the horizontal boreholes at the ends remote from the gallery.

Another notable achievement was in making accurate intersection between these vertical holes and the horizontal holes 200 ft. below them. Novel techniques to achieve this included the use of a remote reading compass for surveying the horizontal boreholes, developed in association with the Admiralty Compass Observatory. Radioactive isotopes were also used to assist in making these intersections.



External water cooling of the main pipeline supplying gas produced in the coal seam to the 3.75 mW pilot power station at Newman Spinney, near Chesterfield

Other boreholes were drilled from the surface to intersect the gallery for primary admission of air to the system. Secondary air inlet boreholes were also prepared to be brought into use if required as gasification proceeds.

When the system was completed, ignition was started in the gallery. This was brought about by 'bonfires' of coal and timber ignited electrically from the surface.

Air blown down the boreholes into the gallery brings about a gasification reaction. The gases travel along the boreholes within the seam and back to the surface via the vertical uptakes and thence by means of surface mains to the power station built by the Central Electricity Generating Board.

The gas is cooled by the direct injection of water, supplemented by surface cooling of the mains. These simple methods, while suitable for a pilot plant which is only due to work for a short time, would, on a commercial plant be replaced by conventional gas cooling equipment.

Air for gasification is supplied by electrically-driven blowers which are located in a building adjacent to the power station convenient for control purposes, and the air is taken to the field by mains which run parallel to the returning gas main.

The gas approaching the power station can, if required, be pased through a booster. The gas produced by this means is of low calorific value and at present is only considered as a source of power. It is burned in a boiler of special design, to raise steam which is then converted to electric power in conventional equipment. A wide range of indicating and recording instruments is provided for close and accurate control.

Q. & Q. Mexican Order

Quickfit and Quartz announce an order of 620 assemblages sets comprising nearly 10,000 pieces for the National University of Mexico, Mexico City.

Mr. E. L. Harrison, sales director, says that the assemblages will be used for teaching purposes.

PREVENTING CORROSION IN OIL-FIRED BOILER PLANTS

Paper at Liquid Fuel Conference

PROBLEMS of corrosion in boiler plants fired by residual fuel oil of high sulphur content (3 to 4½%), and the most promising measures of alleviation known at present were dealt with by Dr. H. E. Crossley (Central Electricity Generating Board) at the conference on 'Major developments in liquid fuel firing 1948-59' organised by the Institute of Fuel and held in Torquay from 11 to 14 May.

The greatest amount of work on corrosion problems had been carried out at the Bankside 'B' and Marchwood Power stations. Loss of efficiency in the first instance had made it necessary to modify the Bankside 'B' boilers so that the required degree of superheat could be obtained without using undesirable excess of air for the combustion. It was found that the amount of excess oxygen could be reduced to 3% in the flue gases, and at the same time, it was indicated by direct determination of SO_3 and dew point measurement that there was then considerably less sulphuric acid present in the gases than previously.

At Marchwood reduction of excess oxygen to less than 1%, and occasionally 0.5%, had led to flue gases containing 2 to 7 p.p.m. SO_3 and the dew point was in the range 240° to 255°F. Commissioning of a new boiler at Marchwood recently had shown that in the first few weeks of operation the flue gases contained only 5 p.p.m. of SO_3, but after 400 hours of operation, SO_3 had risen to approximately 10 p.p.m. Major responsibility for production of sulphur therefore lies with the combustion.

At Ince Power Station, trials have shown that when the CO_2 content of the flue gases was raised from 13 to 15% (i.e. a reduction in free oxygen content of from 4.5 to 1%, SO_3 content fell from 18 p.p.m. to 7 p.p.m.

Powdered Bases

Experiments with powdered bases such as dolomite and magnesium carbonate had shown that these additives retarded the rate of blockage and corrosion of air-heaters, but the products of the reactions and the additives themselves fouled heating surfaces in the boiler, economiser and air-heater at such a rate that cleaning became necessary after about 1,000 hours of operation. Dr. Crossley said it would seem that a powdered base similar to dolomite was unlikely to be sufficiently effective to prevent corrosion of ducting, and the products of reaction, particularly magnesium sulphate, might even be harmful to the concrete casings of electro-static precipitators.

Tar bases had been tested at Bankside 'B' and Marchwood Stations with favourable results only at Bankside 'B'. It was believed that the major effect was prevention of corrosion of metal surfaces by an inhibiting action. It appeared necessary to control the amount of tar base very carefully, as air-heaters blocked more rapidly when an excess of tar base was injected.

Ammonia gas had been tested at Marchwood but it had proved impossible to find a suitable temperature to avoid the excessive use of ammonia by SO_3, or blockage of air-heaters by ammonium bisulphate which itself could be corrosive. Application of ammonia gas as additive to a coal-fired boiler at Deptford East Power Station, however, had apparently been successful. An explanation offered for the contrast between these results by Dr. Crossley was that possibly there was a difference in the character of the flue dusts obtained from oil-firing and coal-firing. He felt that the carbon fraction of the flue dust from coal-firing might have prevented the formation of ammonium disulphate or reduced this compound to the normal sulphate, as this fraction of flue dust was shown previously to be effective in reducing SO_3. By contrast, the carbonaceous fraction of the flue dust from oil-firing appeared to be resistant to sulphuric acid. An attempt to introduce flue dust from a boiler fired with pulverised fuel as well as ammonia gas proved disappointing.

Low Dew Point

A smoke of zinc oxide, produced by injecting zinc powder into the flame had been tested at Southport Power Station with encouraging results. Flue gases had a dew point as low as 140°F. At Tilbury, similar success had been achieved, the dew point being 120°F or less and the amount of SO_3 in flue gas was from 5 p.p.m. to zero. Dust collected at the end of the boiler system was dry and free running. An attempt to apply zinc at another station (Bromborough) was less satisfactory and serious slagging developed. It was thought that the method of injection had not been satisfactory.

At the time of writing his paper, Dr. Crossley said that zinc appeared to offer considerable advantages as an additive, but it remained to be seen whether introduction of an inorganic smoke such as zinc oxide into a flame continued to be satisfactory when deposits of oil ash accumulated on heating surfaces with continued operation. He suggested that there was a possibility in the future that an oil-soluble dope might be produced to give the same effect. Also, it might become necessary to test the value of magnesium oxide smokes produced by oil-soluble dopes, although use of magnesium oxide would only be justified by considerably greater efficiency owing to relatively high cost.

The ideal answer to acid corrosion problems in boiler practice, Dr. Crossley felt, would be the reduction of the sulphur content of residual fuel oils, and although such a measure had frequently been described as uneconomic and impracticable, he suggested that the position should be periodically reviewed, bearing in mind the serious troubles which had arisen from high sulphur content and the high cost of providing measures of alleviation.

With the limited use of residual fuel oil in British power stations, superheater fouling had not been a major problem. As residual fuel oil was apt to contain adventitious inorganic matter, particularly sodium compounds, there was a possibility of accumulation of hard deposits on superheaters. Analyses of such oils had shown variable amounts of sodium up to 100 p.p.m. and Dr. Crossley believed that when there was continued operation for long periods, quantities of sodium of that order would lead to formation of bonded deposits on superheaters. Removal of sodium in residual oils should not be difficult in principle but it was likely to present insuperable difficulties to power stations and other industries. If the quantity of sodium was to be reduced to a harmless level (less than 10 p.p.m.), responsibility seemed to lie with the oil refineries. It was probable, Dr. Crossley stated, that the bonding agent would be an acid sulphate (e.g. sodium pyrosulphate), which could cause high temperature corrosion of steel at temperatures of the order of 1,050°F or over.

The opening address at the conference was given by the president and chairman of the conference Mr. T. C. Bailey, of Shell-Mex and B.P. Ltd.

Of interest to the chemical and allied industries were the following:

Properties of liquid fuels and their practical implications' by J. S. Wilding (Shell-Mex and B.P. Ltd.) and E. Brett Davies (Midland Tar Distillers Ltd.); 'Atomisation and combustion of liquid fuel' by J. R. Joyce (Shell Research Ltd., Thorton Research Centre) and B. V. Poulston (Shell Petroleum Co. Ltd., London); 'Fuel oil gasifiers for industrial use', by R. R. B. Cox and H. Johnson (both of Esso Petroleum Co. Ltd.), 'Oil-fired works boilers by C. A. Roast. (Esso Petroleum Co. Ltd.); 'A summary of operating conditions in shell boilers' by D. J. Heslop. (National Industrial Fuel Efficiency service, London); Packaged fire-tube boilers', by Dr. G. Whittingham. (Technical Services Branch, British Petroleum Co. Ltd.); 'Liquid fuel in the metal industry: a ten-year review', by G. Brett Davies (Midland Tar Distillers Ltd.) and A. B. Pritchard (Shell-Mex and B.P. Ltd.); 'Liquid fuel in the glass industry: a ten-year review,' by Dr. W. R. Bulcraig (Pilkington Brothers Ltd.): 'Prevention of corrosion and deposits', by Dr. H. E. Crossley (Central Electricity Generating Board); 'Liquid fuel in the ceramics industry: a ten-year review', by T. Chippindale, fuel oil manager, North-Eastern Division, Shell-Mex and B.P. Ltd., and 'Oil and its derivatives for town gas manufacture: a ten-year review' by E. R. Ward (South Eastern Gas Board).

Philips Gas Refrigerating Machines Demonstrated

Research and Control Instruments Ltd. gave a series of talks, followed by discussions and a demonstration, on the Philips PW 7000 gas refrigerating machine at Instrument House, 207 King's Cross Road, London W.C.1, on 11, 12 and 13 May. The first of a series of similar talks, these covered the theory and construction of the PW 7000. Initial developments are associated with the PW 7000 liquid air machine, itself, the PW 7050 liquid nitrogen plant and the ECB 380 cold box installation giving controlled temperatures between room temperature and 160°C.

URANIUM AND THORIUM RESOURCES IN BRITISH COMMONWEALTH DISCUSSED

CURRENT estimates of production and reserves of uranium and thorium in non-Communist countries were given by Mr. S. H. U. Bowie, Atomic Energy Division, Geological Survey of Great Britain, at the meeting of the Commonwealth Section of the Royal Society of Arts recently. Reserves indicate that the Commonwealth controls more than three-quarters of the resources of both metals.

TABLE I
Production and Reserves of Uranium

Country	Production 1958 tons U_3O_8	Reserves tons U_3O_8
Canada	13,537	413,000
Union of S. Africa ...	6,245	330,000
U.S.A.	12,560	221,000
France	815	50,000
Australia	700	15,000
Belgian Congo ...	1,000	10,000

No reliable data are available on the production of thorium, reports Mr. Bowie, but a total of 700 tons ThO_2 is believed to have been produced in non-Communist countries last year. At present main uses of thorium are in production of magnesium-thorium alloys and in the manufacture of thorium nitrate for gas mantles. Some is being used in experimental reactors, but as yet there is no great demand for thorium as a fuel element.

Production in Canada

In Canada some 34,800 tons of uranium ore are treated in 11 mills daily. But in addition to being one of the major uranium producing countries of the world Canada is likely to become a major producer of thorium. If a production of uranium oxide of 10,000 tons a year is assumed, about 5,000 tons of ThO_2 could be recovered as by-product.

Total reserves in the Witwatersrand Union of South Africa are estimated at 330,000 tons U_3O_8. The grade of ore averages about 0.025% U_3O_8, although in some parts the grade is over 0.2%. Some 17,000 tons of the total reserves has been fully developed or blocked out for sloping and a further 5,000 tons is contained in safety pillars, dumps and tailing ponds. Thorium does not occur in appreciable amounts, but there are local concentrations in the Dominion Reef area where monazite forms up to 8% of the heavy minerals.

Of the Australian reserves of uranium, estimated at 15,000 tons U_3O_8, 10,000 tons are in the Mary Kathleen deposit. In the case of thorium, Australia has reserves in the large deposits of heavy-mineral sand that occur on the beaches and dunes in south-eastern Queensland and north-eastern New South Wales. The thorium-bearing monazite averages about 3% of the total heavy-mineral fraction. Production in 1957 amounted to 132 tons of high grade monazite concentrate. (thoria content ranges from 6.3 to 7.4%.)

Recent investigations in India have revealed a million tons of low grade uranium ore (0.05 to 0.1% U_3O_8) in Bihar State. There are indications of a grade of 0.15% in deeper holes. Very large placer deposits containing monazite have also been discovered in Bihar and West Bengal and with ilmenite along the south-west coast of India.

At Mindola, Federation of Rhodesia and Nyasaland, production of U_3O_8 in 1958 amounted to 44 tons. There are important reserves of monazite in Nyasaland with a ThO_2 content of just over 7%.

Analyses of selected concentrates from pyrochlore from Nkombwa Hill indicate about 2% U_3O_8 and 0.5% ThO_2. Monazite and thorite occur in the placer tin fields of Nigeria and can be recovered comparatively easily as a by-product of cassiterite. Reserves amount to over 2,000 tons of ThO_2.

TABLE II
Reserves of Thorium

Country	Reserve tons ThO_2
India	300,000
Canada	210,000
Brazil	200,000
Australia	50,000
U.S.A.	50,000
S. Africa	15,000
W. Africa	15,000
Nyasaland	15,000

Italy's Sulphuric Acid Industry

ACCORDING to data collected by the organisation Aschimici, 113 plants operated by 78 firms produce sulphuric acid in Italy. Out of this total, 43 plants use the contact method. Geographically, these plants are distributed as follows (those using the contact process being marked with an asterisk):—

Lombardy (19 plants). *Cesano Maderno, Milan (operated by ACNA); *Pero, Milan (Condor); Bagnolo Mella, Brescia (Consorzio Agrario Provinciale); Cremona (Cooperativa Cremonese); *Gorla Minore, Varese (Elettrochimica Valle Olona); S. Antonio Mantovano, Mantua (Fabbrica Mantovana); Calolzio Corte, Bergamo (Fabbrica Sali di Bario); Secugnago, Milan, and Soresina, Cremona (Federconsorzi); Abbiategrasso, Milan (Fino Carlo); *Treviglio, Bergamo (Industrie Chimiche Baslini); *Melegnano, Milan (Industrie Chimiche Dottor Saronio); Milano-Bovisa, *Romano Lombardo, and *Pavia (Montecatini); *Milan (Nulli); *Nossa, Bergamo (SAPEZ); *Varedo, Milan (Snia-Viscosa); *Caravaggio, Bergamo (Societa' Chimica del Seveso).

Tuscany (18 plants). *Prato (Alcali); S. Donnino, Florence (Ausonia); Florence (Campolmi); Campiobbi, Florence (Etruria); Pescia, Pistoia, and Leghorn (Marchi-Fratelli); *Apuania, Massa, Firenze-Rifredi, Orbetello, Grosseto, Castelfiorentino and *Carmignano, Florence (Montecatini); Empoli, Florence (Parri and Montepagani); Castellina in Chianti, Siena (Puccioni); *Apuania, Massa (Rumianca); Poggibonsi, Siena (SA-MA); *Figline-Valdarno, Florence (Toscana Azoto).

Venetia (17 plants). *Porto Marghera (Cafaro); Bolzano (CEDA); Porto Marghera (CITA); Portogruaro, Venice, and Cerea, Verona (Fabbrica Perfosfati); Marano Veneziano, Venice (Marchi-Fratelli); S. Giorgio di Nog., Udine, *Porto Marghera, Merano, *Vicenza, Legnago, Verona, Piazzola S. Brenta, Padua, and Montebelluna, Treviso (Montecatini); *Porto Marghera (Montecatini-Montevecchio; *Porto Marghera (Sicedison); *Porto Marghera (Sordon); *Porto Marghera (Vetrocoke).

Sicily (11 plants). *Porto Empedocle, Agrigento (Akragas); *Palermo and Augusta, Siracuse (Arenella); *Priolo (Siracuse (Edison-SINCAT); Bicocca, Catania, Campofranco, Cltanissetta, Licata, Agrigento, Milazzo, Messina, and Tommaso Natale, Palermo (Montecatini); Tremestieri, Messina (W. Sanderson and Sons); *Catania (Siculazoto).

Piedmont (16 plants). Chatillon, Aosta, Ivrea, Turin, and Vercelli (Chatillon); Novara (Consorzio Agrario Provinciale); Castel Verres, Aosta (Costruzioni Brambilla); Fossano, Cuneo (La Fossanese); Abbadia di Stura, Turin, *Spineta Marengo, Alessandria, Bra, Cuneo, Vercelli, *Novara and *Avigliana, Turin (Montecatini); *Pieve Vergonte, Novara (Rumianca); *Serravalle Scrivia, Alessandria (SAFFO); *Spigno Monferrato, Alessandria (SALEM); Vercelli (Superfosfati).

Emilia-Romagna (7 plants). Piacenza (Consorzio Agrario Provinciale); Castelguelfo, Parma, Reggio Emilia, Borgo Panigale, Bologna, and Ravenna (Montecatini); Forli (Orsi-Mangelli); Ravenna (Societa' Interconsorziale Romagnola).

Liguria (4 plants). *Cengio, Savona (ACNA); Vado Ligure, Savona (APE); San Gius. di Cairo, Savona (Montecatini); *Vado Ligure, Savona (Monteponi).

Campania (6 plants). Cancello, Caserta (Fabbrica Interconsorziale), Naples (IMAD); *Naples (Industria Chimica del Mezzogiorno); Bagnoli, Naples, Portici, Naples, and Pontecagnano, Naples (Montecatini).

In the Marches (3 plants). S. Elpidio a Mare, Ascoli Piceno (Fabbrica Interconsorziale Marchigiana); Montemarciano, Ancona, Porto Recanati, Macerata (Montecatini).

Apulia (3 plants). Barletta, Bari, Brindisi, Taranto (Montecatini).

Calabria (2 plants). *Crotone, Catanzaro (Mineraria Pertusola); *Crotone, Catanzaro (Montecatini).

Sardinia (2 plants). Cagliari-S. Gilla (Montecatini); *Iglesias, Cagliari (Monteponi).

Umbria (2 plants). Assisi (Montecatini); Nera Montoro, Terni (Terni).

Latium (2 plants). *Colleferro, Rome (Bombrini Parodi Delfino); *Rieti (Montecatini).

During the past seven years, Italian plants produced the following quantities of sulphuric acid (in terms of monohydrate):—

1952—1,497,000 metric tons
1953—1,588,000 metric tons
1954—1,823,000 metric tons
1955—1,954,000 metric tons
1956—2,046,000 metric tons
1957—2,052,000 metric tons
(estimate) 1958—2,100,000 metric tons

As the capacity of existing plants is about 2 million tons a year (45% of which is by 'contact' method and 55% in lead chambers), it appears that today they are working at their full capacity. Consumption of sulphuric acid in Italy keeps pace with production (or vice versa). Many industries utilise it and any expansion in such industries causes an increase in demand.

All the recently built plants produce acid utilising exclusively the 'contact' process which yields purer and more concentrated acid (98-99%) which is an advantage from a purely chemical point of view and also reduces the cost of transportation as such acid can be carried in iron containers.

As regards imports and exports of sulphuric acid, the following totals have been recorded during the past seven years:—

	IMPORTS (metric tons)	EXPORTS (metric tons)
1952	32	14,819
1953	68	4,515
1954	109	4,449
1955	185	2,448
1956	81	209
1957	64	19,395
1958 (Jan./Nov.)	135	61,068

Trinidad College's Valuable Work on Sugar Evaporator Scale

RESEARCH at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, has in the main been devoted to the subject of sugar clarification, the report of the Governing Body and the Principal's Report for 1957-58 indicates. Accumulated evidence now shows that the behaviour of a cane sugar juice is dependent to a large extent on the nature of the material absorbed on the surface of the suspended particles. In most instances protein predominates at the surface and it is for this reason, the report states, that lime-heat defalcation is effective. With refractory juices the protein character of the surface is lost and the evidence suggests that it has been masked by a polysaccharide of the pectinate type. Effect of starches on the flocculation of cane juice has been investigated. When starch solutions are added to a limed and boiled juice large increases have been noted to occur in settling rates. Not all starches are effective and it appears that the organic phosphate content of the starch is important; starches lacking organic phosphate are inactive. It has been found, too, that settling behaviour of a juice depends on its age and that, in general, the settling properties are at an optimum one hour after milling.

Dye-test

An investigation of the adsorption in cane juice of the dyes Bismark Brown and methylene blue has shown that the well known 'Dye Test', often used by the industry as a measure of colloid content, really measures the electrical charge characteristics of the juice particles. The result of the dye-test is only roughly related to the amount of colloid present. Chemical composition of the scale occurring in sugar plant evaporator tubes is now being studied. A number of such tubes have been received with steam-side fouling intact; heat-transfer studies which have been made have shown that the thermal resistance of the steam-side fouling did not represent a very serious loss of evaporator capacity. The fouling was attacked by 5% trisodium EDTA solution, especially when used in combination with a treatment of an organic solvent or detergent. The classic method, of floating kerosine on water which is slowly drained past the tubes, was found to be without significant cleaning properties.

The possibility of adapting the polarographic method of determining levulinic acid to the micro-determination of sugars has been examined but the resulting procedure has proved to be less accurate than had been hoped. In the biochemistry section, a general survey of the phenolic acids and flavonoids of *T. cacao* has been completed. In the course of these studies a new plant metabolite has been isolated and identified as gentisic acid (2:5-dihydroxybenzoic acid). This substance has been shown to be very widely distributed in green plants and in view of its fungicidal properties, the significance of the compound as a factor in the mechanism of natural resistance to plant pathogens is being explored.

Work at the Department of Agriculture on herbicides has revealed that rice will tolerate a mixture of ½ lb./acre of dinoseb and 1 lb./acre of sodium MCPA and that this mixture will satisfactorily control the principal weeds found in rice fields in Trinidad. Work with yams has indicated that 2,4-D compounds are very promising for use as pre-emergence herbicides for controlling weeds in this crop. Of a number of chemicals tested as post-emergence applications, C1PC at 4 lb./acre was the one to which the crop was most tolerant but it did not give satisfactory weed control even with several three-weekly applications.

Scottish Alkali Report Refers to Installation of Plastics Chimney

IN his report, Dr. E. A. B. Birse, Chief Alkali Inspector for Scotland, said that the tendency for fumes from fertiliser granulation to form persistent mists again led to complaints. In one case, an existing 40 ft. chimney was replaced by a plastics chimney 140 ft. high. Conditions appeared to have improved.

Although granulation plant at another works was equipped with a venturi-scrubber which reduced the visible plume from its 90 ft. chimney, the owners had been put to much trouble and expense to keep the scrubber in operation, mainly due to corrosion of a fan with a very high peripheral speed at the tips of the impeller. No further complaints had been received since a new two-stage fan of lower peripheral speed had been fitted. Although the venturi-scrubber reduced the mist-forming emission, it did not eliminate the need for discharge at a reasonably high level, possibly because the gases were relatively cooled by the efficient washing.

Gas Liquor. A new plant for purified gaseous ammonia had been commissioned. As a result one of the liquor concentrating plants that had been out of use came back into regular use; other plants dependent on sulphate of ammonia might have a more secure future. The hydrogen sulphide evolved as waste in the new plant was burned to sulphur dioxide which was converted to sulphuric acid in an existing contact acid plant.

Sulphuric Acid. Since 1952 the number of lead chamber plants had dropped from 12 to three; they had been replaced mainly by contact plants. There had been a trend towards burning sulphur rather than pyrites at both lead chamber and tower plants.

A complaint about fume emission from one of the four contact acid plants was outside the control of the owners. It seemed that wind velocity and other meteorological conditions were responsible. Plants registered for concentrating sulphuric acid included a cascade beaker concentrator, a Kessler tower concentrator, a Gaillard tower and several pot concentrators.

Tar. At one of the large tar distillation plants, faulty maintenance work during an overhaul led to the pipe for collecting foul gas on one of the units being disconnected. At another plant, more faulty maintenance was noted in a failure to replace a blank plug in the foul gas piping. As it was a small plug there was little noticeable emission; nevertheless, states the report, "points of detail such as this can make all the difference between a good plant and an indifferent one and the failure to replace the plug was regarded as an infringement".

TABLE 1
Sulphuric Acid (Scotland)
Excluding Government Plants not Producing for Trade

	1958	1957	1956
	Tons of 100%		
Production	172,000	154,000	156,000
	%	%	%
Proportion of plant in use	74.8	61.8	63.9
Proportion made:			
Chamber and tower	36.6	36.2	46.2
Contact	63.4	63.8	53.8
Raw materials used:	Tons	Tons	Tons
Pyrites	40,000	39,000	48,000
Sulphur	36,000	31,000	28,000
Spent oxide	9,000	8,000	12,000
Zinc ores	—	—	—
Anhydrite	—	—	—

TABLE 2
Ammonia Products (Scotland)

	1958 Tons	1957 Tons	1956 Tons
Conc. ammonia liquor from by-product liquor (25% strength):			
From gas works	3,320	2,590	2,230
From coke ovens	300	400	410
By-product sulphate of ammonia:			
From gas works	3,660	4,450	5,160
From shale works	7,740	9,300	10,840
From coke ovens	14,610	18,730	16,960
Synthetic sulphate of ammonia	—	—	—
Total production of syn. ammonia calculated as NH_3	52,120	52,320	52,070

TABLE 3
Tar Distilled and Pitch Produced (Scotland)

	1958 Tons	1957 Tons	1956 Tons
Crude tar distilled to pitch or other residue	237,330	266,430	257,380
Gross pitch production	74,730	79,860	78,610
Pitch oiled back	33,830	40,140	27,360

TABLE 4
Raw Materials Used (Scotland)
(Consumption in Registered Works—Tons)

	1958	1957	1956
Saltcake process (alkali works):			
Salt decomposed	1,190	1,420	1,180
In chemical manure works:			
Mineral phosphate dissolved	181,350	164,200	179,830

Economics of Two New Gas Purification Plants

Cardiff Liquid Purification Plant Gives Complete Hydrogen Sulphide Removal

DETAILS of two new types of gas-purification plants designed to meet the particular requirements of the Cardiff undertaking of the Wales Gas Board were given by Mr. J. Powdrill, general manager and engineer, Cardiff Undertaking, Wales Gas Board, at the Llandudno meeting of The Institution of Gas Engineers. The paper was in two parts, Part I dealing with a liquid plant and its development to ensure complete reliability of H_2S removal, to statutory requirements, operating direct into holders. Part II dealt with a Gastechnik tower installation for removal of H_2S and also a new method of recovering high quality elemental sulphur and an oxide pellet-making plant of original design.

Liquid purification plant. The process is a simple one basically. Crude gas is washed with a weak alkaline solution containing a fine suspension of hydrated ferric oxide, H_2S in the gas reacting with the weak alkali to form soluble alkaline sulphides. These soluble sulphides react slowly with the iron hydroxide suspension, in a separate delay vessel, forming mainly iron sulphide with a regeneration of alkali. This solution is oxidised in a third vessel, and the iron sulphide is regenerated to iron hydroxide with the liberation of sulphur.

Three Main Sections

For descriptive purposes Mr. Powdrill divided the plant into three main sections (i) gas scrubbers (ii) delay or reaction vessels and (iii) oxidisers, plus two subsidiary sections (iv) sulphur recovery and (v) reagent mixing plants. Area occupied by the plant is 5,600 sq. ft. (84 ft. by 67 ft.) or approximately 930 sq. ft./mill. cu. ft., a considerable saving in ground space compared with that taken up by conventional oxide boxes or tower purifiers.

Gas washing towers. Gas passes in series through six circular welded mild steel towers, 9 ft. dia. by 2 ft. overall height having removable tops and sloping off-take trays in the base to avoid the danger of blockage which can occur in wood grid packing if either gas H_2S contents exceeds a certain figure or if distribution of the liquor over the packing is uneven. The first tower has no packing and the liquor is distributed over the cross-section with a specially designed reaction-type rotary distributor feeding on to a metal distribution grid.

Combination of these two arrangements allows an irrigation rate of over 1,000 gal./sq. ft./hr. while still obtaining single droplets of liquor falling through the free space below the distribution grid. This arrangement, reports Powdrill, has given a very high H_2S removal rate. The second tower is half-filled with hard wood grid packing, the liquor being fed through a rotary distributor. The remaining four towers are filled with hard wood packing equipped with a liquor system of trough distributors.

As the process did not operate successfully with one circuit, due to the presence in the circulating liquor of sulphide and polysulphides in sufficient quantities to give a vapour pressure of H_2S above statutory requirement, the towers were split into two different circuits.

Reaction tanks. Of welded mild steel 9 ft. dia. by 28 ft. high, these reaction or delay vessels allow time for the complete reaction of the soluble sulphides with the iron hydroxide in suspension (seven minutes). The liquor then overflows for delivery under pressure to the oxidisers.

Oxidisers. Four oxidisers of cylindrical welded mild steel construction 14 ft. dia. by 12 ft. 6 in. high are used in parallel. Air for oxidation is mixed with the liquor by means of 13 specially designed liquor-operated air injectors for each oxidiser vessel.

Automatic Defrothing

Frothing problems with resultant difficulties in sulphur recovery and re-use of the liquor, have been overcome by a defrothing device fitted to each oxidiser. These operate automatically; have no moving parts and the energy required to operate them is obtained by sealing in the tops of the vessels and using a low air pressure (9 to 12 in w.g.) to drive the froth through the machines.

Reagent plant. The reagent mixing system comprises a mild steel 400 gal. capacity open-topped soda ash solution tank and a copper solution tank also of 400 gal. capacity and lined with acid-resisting bitumastic material, both of which are fitted with an electrically driven stirrer and stainless steel basket. Solutions of copperas 9% and soda ash 5% are prepared and to enhance efficiency of H_2S removal, a small quantity of tri-sodium phosphate (½lb./480 gal. of reagent) is added to promote the formation of a fine precipitate. Reagent is fed in at the rate of 1½ gal./min. into the primary circuit at the inlet of the oxidised liquor pump, and to the secondary circuit at the rate of ½ gal./min. into No. 2 surge tank.

Reagent

	G/100 c.c.
Ferric iron	0.706
Ferrous iron	0.003
Total iron	0.709
Alkalinity { carbonate	0.031N
Alkalinity { total	0.143N
% oxidation	99

Slightly more than 5% of Ma_2W_2 is added dry to No. 2 surge tank.

Liquor circulation. Approximately 55% of the running costs of the plants are attributed to power costs in pumping the liquors through the plant.

Liquor passing in parallel through the first four towers is collected and returned to No. 1 surge tank. This fouled liquor from No. 1 surge tank is drawn by No. 1 wash liquor pump and passed through delay-reaction tanks where the reaction of H_2S and ferric oxide is completed. This reacted liquor is then pumped under pressure through air injectors fitted to the tops of oxidiser vessels. In these vessels, free sulphur is precipitated and removed from the circuit, and the oxidised liquor is then returned, with addition of fresh reagent to the first four towers.

Liquor in the secondary circuit passes in parallel through Nos. 5 and 6 towers and then to No. 2 surge tank where No. 2 wash liquor pump recirculates the liquor back to these towers less a proportion of the liquor returned to the surge tank, through an air injector, so ensuring thorough oxidation of return liquor.

Efficiency of Towers

Inlet Gas Stream—350 gr. H_2S/100 cu. ft.

Tower	Tower's H_2S outlet	Tower efficiency %
No. 1	140 gr./100 cu. ft.	60
No. 2	10 gr./100 cu. ft.	93
No. 3	100 p.p.m.	97
No. 4	10 p.p.m.	90
No. 5	0.6 p.p.m.	94
No. 6	0.5 p.p.m.	16

Overall efficiency of H_2S removal: 99.99995%.

Chemical reagents. Designated circulating strength of the alkaline solution (soda ash) is between 0.15N and 0.25N total alkalinity and on the second circuit two towers between 0.8N and 1.0N total alkalinity.

Some alkali goes to carbonate as a result of CO_2 removed from the gas and under full-load working conditions approximately 10 to 15% of the alkali is bicarbonate. On full-load working purifying 6 mil. cu. ft./day having H_2S content of 350 gr./100 cu. ft. chemical consumption averages: soda ash, 2,400 lb./day and copperas 700 lb./day.

Chemistry of the process. The chemical reactions occurring in the process are complex with many side reactions. One side reaction has emphasised the need to allow adequate time for H_2S to be fixed by the iron present. If sodium hydrogen sulphide is allowed to reach the oxidisers, sodium thiosulphate is formed with a consequent permanent loss of alkalinity and sulphur, $Na_2S_2O_3$ (as high as 0.2N) is always present in the main circuit liquor.

When HCN is present a large proportion is removed with H_2S to form alkaline-iron complexes. These can materially assist purification but as they are only stable over a narrow range of alkalinity

very careful control of pH of the circulating liquor is necessary.

Sulphur recovery. Sulphur froth as formed is broken down by the defrothers incorporated in the oxidiser and the resultant S sludge flows to two sludge storage and settling tanks. Liquor which separates returns to the circuit liquor and the sludge containing about 6% S and 1.5% Fe_2O_3 is pumped to a sludge boiler and boiled by a Tricone steam heater to coagulate S particles. Coagulated S sludge is gravity fed to a Davy Paxman vacuum drum filter. Sulphur cake as removed contains 40 to 45% S, 35 to 40% H_2O, with 15 to 20% of iron and other impurities. Seperm (a proprietary flocculating agent) has been tried for hastening separation of sulphur sludge, but has had an adverse effect on the final S cake.

Results after three years' working. The plant has proved to be very reliable for H_2S removal, provided adequate control is exercised with preparation of reagent and composition of the circulating liquor. No difficulty has been experienced in reducing H_2S to 5 p.p.m. in outlet gas, with equal success when purifying carburetted water gas and coke oven gas.

Advantages and disadvantages are as follows:

(i) Relatively small capital cost, £54,000 as against £93,000 for oxide boxes of same capacity. (10·07d and 0·12d/therm respectively).
(ii) Small ground space required.
(iii) Flexibility: The plant is quickly brought into action after standing idle.
(iv) Labour requirements of one man/shift.
(v) The plant has been free of corrosion troubles.
(vi) Comparatively high running costs compared with conventional ferric oxide purifiers, i.e. electricity for prime movers.
(vii) Failure of prime movers and pumps has been 'extremely rare'.
(viii) Maintenance costs in 3-year period have not exceeded 0·05d./therm.
(ix) For purifying carburetted water gas the higher temperature of the gas (70°F) adversely affects the degree of H_2S removal, due to light paraffin oils slipping through the electrostatic detarrer inhibiting oxidation of suspended iron sulphides, and causing excessive frothing.

Cost on Full Load

	Pence 1,000 cu. ft.	Pence Therm
Copperas	0.018	0.0036
Sod. carbonate	0.634	0.1268
Electricity	1.000	0.2000
Operating and handling labour ...	0.240	0.0480
Steam and water	0.080	0.0160
Supervision	0.030	0.0060
	2.002	0.4004
Sulphur credit at spent oxide price	0.042	0.0084
Net cost	1.960	0.3920

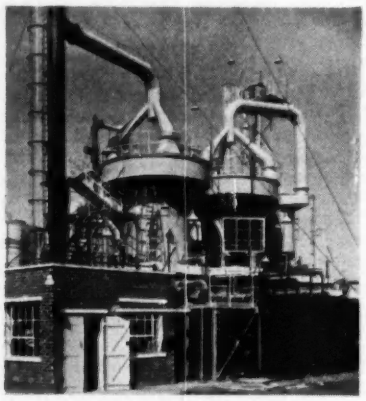
These costs are based on the last three years average figures and are made up as follows:

Copperas, 115 lb./mill. cu. ft. at 30s. ton.
Soda ash, 395 lb./mill. cu. ft. at £15/ton.
Electricity ... ... at 1.425d./unit.
Labour ... ... at 36s. 2d. shift.

Section of this paper dealing with the Gastechnik purification plant will be summarised in a future issue of 'Chemical Age'. Operational results and costings will be included.

Power-Gas Build Eaglescliffe Sulphuric Acid Plant

A PLANT with a capacity of 100 tons of sulphuric acid a day, but capable of working at an overload, has been put into commission at the Eaglescliffe, Co. Durham, works of the Associated



The new sulphuric acid plant

Chemical Companies Group. The production acid can be delivered at strengths up to 98.6%.

The contract was carried out by the Power-Gas Corporation Ltd., Stockton-on-Tees, who erect contact sulphuric acid plant to the design of Chemibau, Dr. A. Zieren, G.m.b.H., Cologne.

D.C.L. Group at Foundry Exhibition

THREE members of the D.C.L. Industrial Group—British Resin Products Ltd., the Carbon Dioxide Department of the D.C.L. Chemical Division and the Methylating Co. Ltd.—exhibited jointly on the Distillers Company's stand at the recent Foundry Exhibition.

Greater part of the displays was devoted to the Carbon Dioxide Department's system for the bulk transport storage and supply of liquid carbon dioxide. The Methylating Co. exhibited as suppliers of isopropanol, both as anhydrous material and as the azeotrope for use in flash dressings. Synthetic resins for shell moulding, marketed under the trade name Cellobond, were shown by British Resin Products.

Week-end Course for Chemistry Teachers

A WEEK-END course for teachers of chemistry in technical colleges is being organised by the Regional Advisory Council for Technological Education, London and Home Counties, at the College of Production Technology, Ashford, Kent, on 26-28 June.

Enrolment forms can be obtained from the council's offices, Tavistock House South, Tavistock Square, W.C.1.

A course for teachers of chemistry is also being held at Liverpool College of Technology on 3 and 4 July.

Application forms are obtainable from the Head of the Chemistry and Biology Department, College of Technology, Byrom Street, Liverpool 3.

Millionth Ton of Anhydrite Shipped from Long Meg

MILLIONTH ton of anhydrite was shipped with ceremony from Long Meg Mine, near Penrith, to the converters in Widnes on 20 May.

This figure represents the output of the mine in the last four years and achieves the target of a quarter of a million tons a year which was set when this development project was started.

Chairman of United Sulphuric Acid Corporation, Mr. R. J. Kerr-Muir, O.B.E., pressed a button releasing the millionth ton into a railway wagon specially decorated for the occasion. Mr. D. Shackley, director of the Long Meg Plaster and Mineral Co. Ltd. then presented Mr. Kerr-Muir with a commemorative plaque carved from a slab of anhydrite. Also present was M. J. B. Poynder, general manager of U.S.A.C.

Extensions to Thames Haven Oil Facilities

SINCE the first petroleum refineries in the U.K. came into operation in 1950 imports of oil into Thames Haven have increased until in 1958 they reached nearly 6 million tons. Refined products leaving the refineries in the Thames Estuary totalled 4,200,000 tons.

To meet the increased demand the jetties, storage tanks, pipelines and handling equipment of London and Thames Haven Oil Wharves Ltd. have been modernised and extended. A total storage capacity of 1,750,000 tons has been provided and more tanks are under construction.

Conference on X-ray Diffraction in London

A CONFERENCE on X-ray diffraction and spectrography will be held at the Department of Chemistry, Imperial College, London S.W.7, from Monday, 6 July to Friday, 10 July.

The conference will discuss and evaluate modern techniques and instrumentation for diffractometry and fluorescent analysis. An extensive range of modern equipment will be available for demonstrating the principles of these methods over a wide field of applications. Time will be made available for the consideration and study of samples submitted by members.

Full information with details of registration fees may be obtained from the conference secretary at Research and Control Instruments Ltd., Instrument House, 207 Kings Cross Road, London W.C.1.

Scheme for Course in Chemical Engineering

A new pamphlet entitled 'Scheme for a Full-time Course in Chemical Engineering' has been published by the Institution of Chemical Engineers, 16 Belgrave Square, London S.W.1, from whom it is available price 2s post free. The pamphlet recognises the developments which have taken place in the teaching of chemical engineering at technical colleges since the first 'scheme' was published 14 years ago.

Analytical Review

New Aid to Chromatography and Paper Electrophoresis

By
T. S. West, Ph.D.

In this article Dr. West reviews a new development in paper chromatography and electrophoresis which utilises the application of centrifugal force to speed up and otherwise assist these separation methods. Also reviewed is a new idea that has been formulated and which promises the mathematical characterisation of end-point sharpness in complexometric titrations. Two simple parameters which are related to the fundamental constants of the chemical system give an immediate guide to the end-point sharpness under any given conditions of pH, etc.

THE use of centrifugal force as an aid to the separation techniques of paper chromatography and electrophoresis has been advocated vigorously by H. J. McDonald and his co-workers in the U.S. His most recent publication which appears in the current issue of *Analytical Chemistry* summarises previous experience in this field (**1**). It describes a simple apparatus which may be used for one or two dimensional separations on circular paper sheets rotating in a horizontal plane.

The developed chromatograms closely resemble those of the classical radial pattern. The sheets are fixed at the centre and are held in a taut position by rotation at 300-1,000 r.p.m. The developing solvents are fed to the paper in a continuous stream at a point slightly away from the centre of rotation. The sample solution is applied in the form of spots on a ring marked round the centre of rotation or alternatively it can be introduced as segments or whole rings. The use of centrifugal force speeds up chromatographic separations quite markedly though it is not claimed to improve them in any way. R_f values are recorded for 16 amino acids with the use of two developing solvents.

Suitable Chamber

For electrophoresis, a suitable chamber is obtained by clamping together a Bakelite (lower) and Perspex (upper) tray. Platinum strip electrodes are clamped along the full length of the two long edges of the paper strip. When the paper is correctly positioned it makes contact with neither the upper nor lower plates. The short ends of the paper are serrated and the nine teeth at either end dip into compartmented troughs which are positioned in such a way that they swing out into the plane of the paper when the unit rotates. The sample is applied at two points symmetrically distributed about the centre of rotation along the central longitudinal axis of the paper. As the sheet rotates more liquid is introduced at a point near the centre of rotation to prevent drying out of the paper.

In this way the developing solution is applied as a ring and moves out uniformly under the influence of capillary and centrifugal motion as a circular front till it reaches the platinum strip electrodes. It then streams along the edges of the electrodes till it passes into the four corner collecting compartments of the two troughs. This ensures continuous removal of electrolysis products from the electrodes.

The patterns obtained by this method are such that the one developed on one half of the paper is the mirror image of that on the other half. Consequently an authentic sample of a substance can be applied on one side and a mixture for analysis on the other. When the separation has proceeded to the necessary extent, the sheet can be folded in half and the presence or absence of the given substance can be determined by observing congruence of the 'known' and 'unknown' zones.

Considerable variation can be obtained by applying centrifugal and electrical forces separately, simultaneously or in sequence. The centrifugal electrophoretic technique is in fact a new development of the classical, time-consuming curtain technique. It appears to be a very attractive development and should find ready widespread application. The apparatus has been made commercially available in the U.S.A.

Mathematical Interpretation of End-Point Sharpness

A paper from Professor Reilley of the University of North Carolina points the way to an interesting new development on the characterisation of end-point sharpness. It has always been a point of contention that what one worker describes as a sharp end-point has been interpreted otherwise by others.

Now it has been shown that a simple numerical scale can be set up which derives a relationship between sharpness and the significant parameters of the chemical system involved in the titration. Sharpness (i.e. the necessary minimum increment of titrant which produces the colour change) is not of course the only factor which must be considered since the colour contrast of the two or more indicator forms is nearly as important. However, this factor is also susceptible to similar treatment and will be dealt with in a later paper from the same source.

In the present paper (**2**), sharpness is deduced for complexometric end-points by consideration of pM-pH and pY-pH diagrams (M denotes metal ion concentration and Y denotes complexone concentration). Two end-point indices are evolved which allow immediate assessment of the colour change in the titration. Moreover, the indices allow computation of the sharpness under varying experimental conditions and predict the feasibility of selective titration of ions in mixtures.

A simplified non-mathematical explanation may be visualised as follows. At a fixed pH at the beginning of a titration the pM value of the solution has a certain value (A). When the solution has been 100% over titrated with a complexone the pM value rises to a new value (C). These may be depicted as the values corresponding to the flat 'buffer' regions of the titration curve (pM/titrant) on either side of the inflection (see diagram). If these values (A) and (C) are calculated for varying pH values and plotted as a function of it, then two lines (A) and (C) are observed the distance between which at any particular pM is a measure of the pM 'break' at that particular acidity. If on the diagram we draw another line (B) which represents (at any given pH) the position where the indicator concerned is 50% complexed by the metal ion then we have the complete set-up for evaluating the end-point indices Δ_1 and Δ_2 which correspond to the distance between the line B and A and C respectively. Index Δ_1 is a measure of the stability of the indicator-metal complex; Δ_2 represents the ability of the complexone to break it down. If Δ_1 is small and Δ_2 large, premature end-points are observed. If Δ_1 and Δ_2 are both large, sharp end-points result. Thus for the system Zn^{2+}-Solochrome Black T-EDTA at pH 7.8 Δ_1 and Δ_2 are 5.4 and 4.8 respectively while Zn^{2+}-Zincon-EDTA at the same pH

(*Continued in next page*)

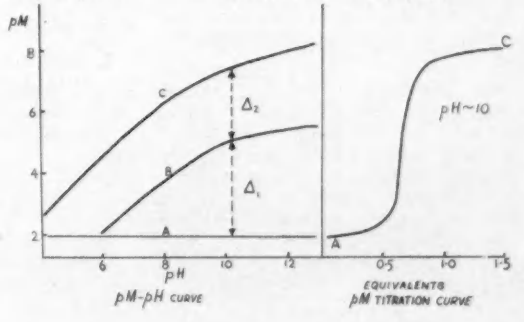


Diagram indicating set-up for evaluating end-point indices

Statistical Methods as Aid to Improving Efficiencies of Complex Chemical Processes

BECAUSE of the great complexity of many modern chemical processes, methods for improving efficiencies often have to be entirely empirical. Statistical methods are of great value in separating real effects due to deliberate variations in the process conditions from inherent errors that are always present, noted Mr. G. A. Coutie, Dyestuffs Division, Imperial Chemical Industries Ltd., at the joint symposium on 'Instrumentation and computation in process development and plant design' sponsored by the Institution of Chemical Engineers, the Society of Instrument Technology and the British Computer Society. (See also CHEMICAL AGE, 16 May, p. 825.)

Techniques for using statistical methods both in the laboratory and plant were described. In the laboratory it was often possible to approximate the relation of a response (such as cost) to several operating variables (such as temperature, pressure) by a second degree equation. On the plant scale the technique of 'evolutionary operation' is regarded as more suitable by Coutie, in which the effects observed as a result of continual, small, deliberate changes in operating conditions were used as a guide to optimum efficiency.

Dyestuff Plant Studied

Coutie instanced a recent example where difficulties had been experienced in obtaining satisfactory yields in the plant manufacture of a dyestuff. This had led to a laboratory study of the kinetics of the reaction involved in the process. It was soon found that the pH of the system at a certain stage was critical. This in turn led to plant experimentation in which the effect on yield of varying the pH between the limits 4.5 to 8 was investigated, and an improvement in yield of 5-6% against the former process was achieved. If other plant or laboratory experimentation had been started without knowledge of the kinetic theory many variations in the concentrations of the different reactants might have been tried before it was realised that a single combination of these, corresponding to the pH of the system, was a major yield-determining factor.

The method for plant-scale process optimisation, evolutionary operation, had been used with considerable success in a number of chemical plants both in England and more recently, in America. Coutie reported. Systematic small modifications following a carefully planned and continuously repeated cycle were made. As successive cycles were averaged evidence of the modifications was gradually built up, and eventually it was possible to see in what way the method of operation of the plant should be adjusted in order to obtain greater efficiency.

In administration for evolutionary operation, Coutie reported, it has been found worthwhile and completely satisfactory to train a chemist in simple statistical techniques and to make it his full-time (or part-time, if necessary) task to collaborate with plant superintendents in the design and interpretation of evolutionary operation, and also to maintain liaison with the statisticians so that more advanced technique may be used where necessary Evolutionary operation had been applied over the past five years in six of the factories operated by the Dyestuffs Division, and currently some 40 processes were operating in this way. For fairly large-scale processes, an improvement of only 1% in efficiency could lead to substantial annual savings.

Factors that had entered most frequently into the programmes had been, not surprisingly, temperature, time and concentration, while the most common responses were yield, purity or, where possible, a composite cost function which took into account raw material values, operating costs and yields.

Reference was made to two examples —a batch process making a dyestuff intermediate in each of 10 similar units, annual output being about 2 million lb., and a catalytic reaction which was continuous within catalyst runs of about two weeks' duration. In the dyestuff intermediate process the response of chief interest was stated to be the yield which varied from unit to unit and also between successive batches in the same unit. The item for analysis in evolutionary operation when this was started four years ago was fixed as the average yield over all units for a week, which represented a production of about 30 batches, three from each unit. Initially 12 factors were written down including 2 times, 4 rates, 2 concentrations, a temperature and a pressure, each of these being felt likely to affect the yield. These factors had been varied in phases of 2 or 3 at a time, and there had so far been 10 phases. Within the first two years, Coutie reported, an average yield increase over all units of approximately 10% was achieved. During the second two-year period further smaller improvements had been gained, and the previous increase in efficiency had been maintained. In the case of the catalytic reaction increases in efficiency of the order of 1% had been achieved, which because of the volume and value of production, represented considerable savings.

Analytical Review

(*Continued from previous page*)

has Δ_1 and Δ_2 equal to 1.8 and 8.4. The first end-point is sharp; the second drags before the end-point and must be titrated painstakingly to pure yellow.

pY-pH Diagrams are constructed similarly and are necessary for the study of competitive systems, masking agents and sensitised indicators, etc. The equations which relate the end-point indices to the parameters of the chemical system of the titration are fully defined and elaborated in the original paper (2).

There can be little doubt, but that this is a significant paper. Analytical chemistry has progressed much in the past few decades as it has been placed on a firm mathematical basis by a long line of distinguished research workers. The mathematical definition of end-point sharpness should be hailed as another milestone.

REFERENCES

1. McDonald, H. J., Ribeiro, L. P. and Banaszak, L. J. *Analyt. Chem.*, 1959, 31, 825.
2. Reilley, C. N. and Schmid, R. W., *ibid.*, 1959, 31, 887.

Agricultural Use of Fluoroacetamide

Fluoroacetamide should be included in the Agriculture (Poisonous Substances) Regulations as a Second Schedule Part II substance but its use at any time on a non-edible crop is acceptable, the Ministry of Agriculture states. The regulations provide for the use of protective clothing by operators.

Midland Silicones hold European Sales Conference

MORE than 25 agents representing Midland Silicones Ltd. in 20 European countries met in London last week for the company's 1959 European sales conference. On 25 May, agents from Scandinavia, the Benelux countries, Austria, Switzerland and Italy, Spain and Portugal, and from the Iron Curtain countries, including Russia and Czechoslovakia, heard chairman Mr. E. J. Tucker, open the three-day conference.

Export sales manager, Mr. Charles Caldwell, recently back from a world tour, reviewed the European export organisation of Midland Silicones and then overseas agents and M.S. sales managers delivered a series of papers on themes ranging from 'What an agent for technical products requires of his principal,' by Mr. W. Kaiser, director of Plüss-Staufer A.G., Switzerland, to 'Research and development to meet the needs of an expanding market,' by Mr. J. S. Hughes, manager of the M.S. process and product development department at Barry, South Wales.

U.K. Chemical Trade By Air

Of the U.K.'s total exports of chemicals of £263.1 million in 1958 2.1%, valued at £5.6 million, went by air. In 1957 2.4% of exports went by air.

Imports by air in 1958 were £6.1 million, or 5% of the total chemical imports of £119.8 million.

Overseas News

SCHOLVEN-CHEMIE A.G. TO START-UP 6,000-TONNE POLYTHENE UNIT

PRODUCTION figures of one of W. Germany's petrochemical producers, the Scholven-Chemie A.G. concern of Gelsenkirchen, for last year are contained in the company's annual report issued this week. The company is owned by the Federal-controlled Bergwerksgesellschaft Hibernia coal-mining company. In October 1958 a new mineral oil processing plant was brought into operation at the company's Gelsenkirchen plant, which had the effect of raising the plant crude oil throughput by 28% for the year over the 1957 total to 880,000 tonnes. In connection with this new installation, a new sulphuric acid plant was brought on stream. The production of pure sulphur, which over the year totalled 6,500 tonnes, was stopped completely during the course of 1958, while the new sulphuric acid plant produced 4,800 tonnes of 96% contact sulphuric acid during that part of the year that it was functioning.

Output of the synthetic fertiliser plant which Scholven operate jointly with the Salzdetfuth concern was 72,000 (51,000) tonnes of full fertilisers and 43,000 (31,000) tonnes of other fertilisers; the total 1958 fertiliser output is to be doubled in the current year. Building work has been completed on a polythene installation, and this is soon to come into operation with an annual production of 6,000 tonnes.

In all other sectors of the company's activities, including pressure refining of benzole and the processing of coke gas, production rose last year; only in the field of nitrogen output in the form of liquid ammonia did production fall—by 10%—owing to the poor state of the market, particularly from overseas buyers. This production was further limited in the first few months of the current year.

Czech State Concern To Buy and Sell Patents

The Czech Government has set up a new State concern under the name of 'Polytechna', the job of which it will be to buy and sell patents and production licences in the chemical and related fields.

Production Tax on Mercury Abandoned in Italy

The Italian Government regulation abandoning the production tax on Italian mercury for a period of three years has now come into force. It is back-dated to 1 February 1959. As a result of the heavy tax, Italian exports of mercury had fallen in 1958 to 393 tonnes, 60% down on the figure for the previous year. A statement issued in Rome by Italy's leading mercury producer, Monte Amiata says, however, that the removal of the production tax will not have the full desired effect on world markets as it is limited to a time period. The Monte Amiata concern lost 170 million lire last year.

Jefferson Lake's 1959 Sulphur Shipments from Peace River

Jefferson Lake Petrochemicals of Canada expect to ship about 60,000 long tons of sulphur from their Peace River plant during 1959 principally to consumers in British Columbia and the State of Washington. Production of sulphur last year at Peace River, which was stock piled during the year, amounted to 55,900 long tons and at 31 December had a market value in excess of $1 million.

Production at the plant is expected to increase to 100,000 a year as additional quantities of concentrated hydrogen sulphide gas are furnished by Westcoast Transmission Co. Ltd.

Bigger Production from Portuguese Ammonia Plant

In its annual report for 1958 the Sociedade Portugesa de Petroquimica has announced that the capacity of the factory now under construction has been increased and it is intended to produce an average of 300,000 cubic metres of town gas and 170 tons of ammonia daily from petroleum refinery by-products.

Pharmaceutical Factory for Hong Kong

A factory has been opened at Aberdeen on Hong Kong island by Antibiotics Ltd., for the manufacture of antibiotic products and as a distribution centre for other pharmaceutical products.

The plant, which cost 2¼ million Hong Kong dollars (£156,250), is completely air conditioned and bacteriologically sterile. It provides 32,000 square feet of factory floor space and will give employment to upwards of 300 people.

Electric Reduction Co. Purchase Fertiliser Plant

Plans for the further expansion of their activities in Canada are announced by Albright and Wilson Ltd. The Electric Reduction Co., their Canadian subsidiary, have purchased a modern fertiliser plant at Port Maitland, Ontario.

The plant which has been acquired is that of Dominion Fertilisers, Ltd.; it produces phosphate fertilisers. Activities of the plant will be linked with the new $10,000,000 chemical project at Port Maitland.

Two months ago Albright and Wilson stated that ERCO would build new plants to produce phosphoric acid, sodium phosphates and other products for the expanding industrial and agricultural markets of Eastern Canada.

Phosphoric acid is the starting point for high analysis fertilisers and S.W. Ontario is the major and growing market in Canada for such fertilisers, which have until now relied on large quantities of imported raw material for the detergent industry as well as for metal finishing and food processing.

Hungarian Detergent Plant on Stream

Hungary's first plant for the production of dodecylbenzol, raw material for detergents, has been opened at the Rákoskeresztúr premises of the United Chemical Works. It will supply half the country's requirements.

Chemico Build Urea Plant for Monsanto, U.S.

A urea plant with a capacity of 100 tons a day built by Chemico for Monsanto Chemical at El Dorado, U.S.A. A plant for Cyanamid of Canada at Hamilton, Ont., also began production recently

Parke, Davis Open Branch in South Africa

Parke, Davis and Company announced in New York recently that building work was commencing on the £200,000 branch office located to the east of Johannesburg. The new premises will house a combined manufacturing and sales organisation and are expected to be completed by the end of this year.

C.S.I.R.O. Develop New Method of Roasting Ores

C.S.I.R.O. has a new division of mineral chemistry; the minerals utilisation section of the C.S.I.R.O. chemical research laboratories having become the division of mineral chemistry. It is the third division in the laboratories. First chief of the new division is Mr. R. G. Thomas, who has been officer in charge of the group since its formation in 1940.

Achievements of the group include

processes now being used to extract uranium at Rum Jungle and Radium Hill are based largely on its work.

Another line of work in which the group participated has resulted in a method for roasting copper ores using the fluid bed technique and ways of electro-winning copper from the resulting calcines. The division has also been very active in the study of beach sands as sources of mineral wealth.

Of particular interest is a new method for purifying thorium, while discovery of an improved method of separating zirconium from hafnium has led to the sale of overseas patent rights for $250,000.

Pakistan May Export Liquid Natural Gas

Pakistan is considering the possibility of exporting liquefied natural gas. A team from the U.S. company Constock International Methane Inc., visited Pakistan recently and had talks with officials of the central government and the Sui Gas Co. and visited the gas fields at Sui.

C. J. B. Co-operate in Persian Fertiliser Project

Work has started on the gas line and fertiliser plant project which Constructors John Brown and two French firms are carrying out near Shiraz, Persia.

Plans for a fertiliser plant and plastics factory in the Ahwaz area have been abandoned, but it is expected that the plastics plant will be constructed elsewhere, probably in Fars province, by private enterprise aided by the new Industrial Credit Bank.

Sumatran Urea Plant Plans

One of the world's largest urea plants is scheduled for Palembang, Sumatra. The Republic of Indonesia has just signed a $30 million contract with the Foster Wheeler Corporation, U.S., for the designing and building of a unit to produce 330 short tons per day (100,000 metric tons annually) of prilled fertiliser-grade urea by the Pechiney-Grace recycle process. The plant is due to be completed in 1962.

The installation which will be designed to allow for 50% future expansion, will cover 67 acres. Some 200 tons a day of ammonia will be synthesised at the site using the Casale method.

When in operation, the fully integrated plant is expected to save Indonesia $10 million per year in foreign exchange now being used to import fertilisers for rice and other vital agricultural products.

Dominion Tar Open New Ontario Distilling Plant

Dominion Tar and Chemical Co. Ltd. have opened their new tar distilling plant at Hamilton, Ont. The plant will produce coal tar products, distillates and pitches by a unique process of continuous distilling. Previously, coal tar distilling had been done in batches at a slower rate of output and higher operating cost.

Coal tar for the Hamilton plant is moved from neighbouring steel mills by tank trucks and cars, and deposited into four 500,000 gall. storage tanks. An 8-in. pipeline from the docks is also provided so tar can be brought in by vessel. The tar is then graded and blended as needed for further processing in four 250,000 gall. feed tanks for the distillation unit.

Phillips Petroleum's S. African Carbon Black Project

Phillips Petroleum, U.S. and Industrial Development Corporation of South Africa Ltd., are forming an equally owned company, Phillips Carbon Black Co. (Proprietary) Ltd. to build and operate a 22 million lb./year oil carbon black plant in the Union of South Africa. It is expected to be in operation within two years.

Cyanamid Participate in Formosa Antibiotics Unit

Chemical development in Formosa includes an agreement between the state-owned Taiwan Sugar Corporation and Cyanamid International Corporation of the U.S. for the production of antibiotics. Cyanamid are expected to invest $800,000.

Deposits of coal, placer gold, manganese ore and pyrites have been found in the mountains along the east-west highway.

Fertiliser production in 1958 was 208,000 metric tons, 32,000 tons above 1957 but still nearly 500,000 tons short of Formosa's requirements.

Italian Chemical Output's Rapid Growth

Italian chemical output is growing at an increasing rate. In 1958 output was 7% higher than in 1957, compared with an increase of only 4% between 1956 and 1957. In value 1958 showed an increase of 5.1% over 1957 compared with an increase of only 1.6% between 1956 and 1957.

This increase took place in spite of the fact that there was a drop of 1.33% in wholesale prices. The drop in prices has not been uniform. Prices of chemicals for agriculture, for instance, declined by 8% and those of plastics materials by 6.7%. Prices of pharmaceutical products went up, however, by 1.6% and those of derivatives of basic chemicals by 2.1%. With annual earnings of 453 milliard lire (about £265 million), the chemical industry is Italy's third largest.

Chilean Phospate Plant Switched to Granulation

The plant established near Penco, Chile, with French and Chilean capital for the processing of phosphates from imported raw materials has recently been converted to the processing of granulated phosphates.

Czechs Seek Polish Sulphur

A delegation from the Czechoslovak chemical industry, which has been visiting Poland, has signed an agreement for developing co-operation between the chemical industries of the two countries. Polish sources say Czechoslovakia is particularly interested in buying Polish sulphur, soda and dyes.

South Africa Grants Duty Rebate on Sodium Carbonate

The Government of South Africa has made provision for the rebate of the intermediate duty on sodium carbonate excluding soda crystals in bulk, when imported or withdrawn from bond by registered manufacturers in a wide range of industries.

W. Germany to Supply Equipment for Czech Rubber Factory

The Czechoslovak 'Strojimport' enterprise, which handles machinery imports, has drafted an agreement with the West German company, D.I.A., for the purchase of two million dollars' worth of engineering equipment for the production of synthetic rubber.

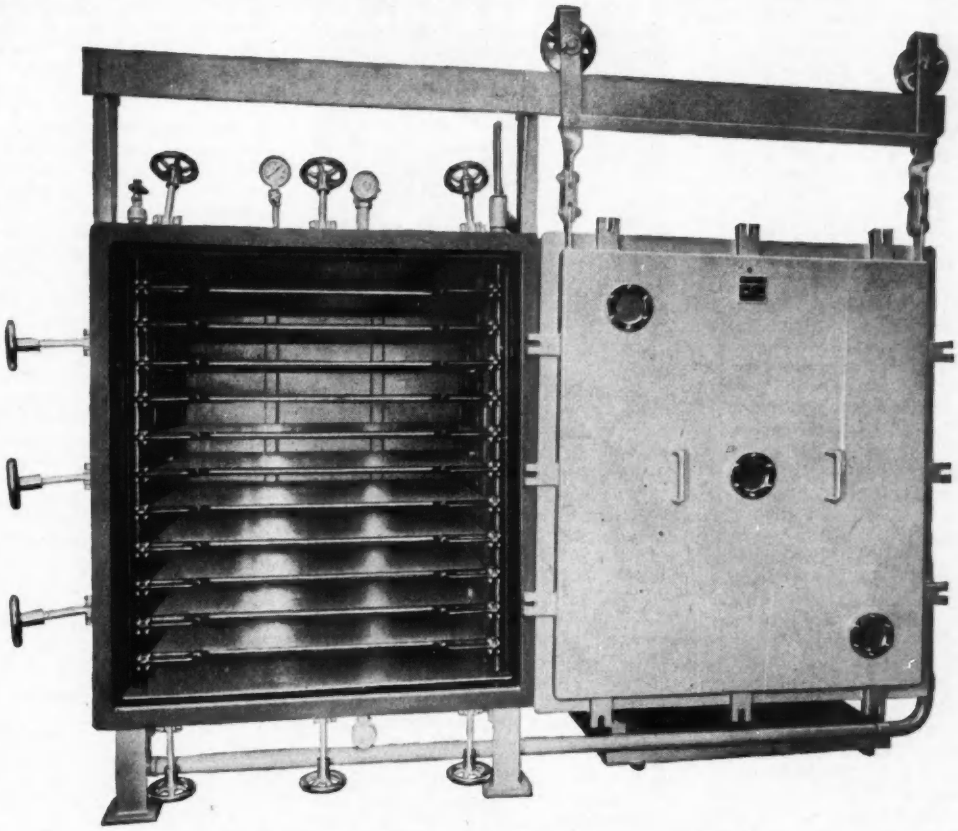
U.S. Chemists Produce Phosphinoborines For High Temperature Usage

CHEMISTS of the American Potash and Chemical Corporation, Los Angeles, California, have synthesised a new type of molecule which may lead to the development of heat-stable plastics. According to Joseph C. Schumacher, vice-president of research, the discovery is regarded as "a significant advance" in the search for plastics capable of enduring operating temperatures far higher than the limits imposed by the best materials available today. At the present time most plastics are stable only to approximately 300°F. American Potash's current project, it is hoped, will develop plastics that can withstand temperatures up to 400°C (approximately 750°F).

The new compounds, known chemically as phosphinoborines, are based on boron and phosphorus (see CHEMICAL AGE, 16 May, p. 827). The molecule is described as a "linear chain of repeating, tetraco-ordinate phosphinoborine units" with a high molecular weight of about 12,500.

Two basic types of phosphinoborine materials have been developed so far. One is a translucent, milky white compound that is heat-resistant but brittle. The other, in appearance, is much like existing plastics but does not possess heat stable characteristics. Further research is necessary to combine the desirable properties—plasticity and heat-stability—into a commercially suitable product.

The new materials are the result of four years of research by the company in co-operation with the U.S. Air Force's Air Materials Laboratory at Wright Air Development Center, Dayton, Ohio.



Araldite stands up to it

The new Apex 105E vacuum tray drier is coated internally with epoxy resin paint applied by M. E. Beswick Ltd., Byfleet. For this application, a paint based on Araldite 985E was chosen to provide a protective coating with outstanding adhesion to the metal walls. In common with all Araldite coatings, toughness is combined with flexibility, high resistance to corrosion and to wide variations of temperature and humidity.

Araldite

epoxy resins

Araldite is a registered trade name

Araldite epoxy resins are used

- ★ **for bonding metals, ceramics, etc.**
- ★ **for casting high grade solid electrical insulation.**
- ★ **for impregnating, potting or sealing electrical windings and components.**
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AP 438

PEOPLE in the news

● MR. F. N. MORRIS is resigning from his position as sales director and chief chemist, Leek Chemicals Ltd., to take up an appointment with Dow Agrochemicals Ltd.

● At the annual general meeting of the Fertiliser Society MR. J. FRISKEN (Fisons Ltd.) was elected president and DR. H. L. RICHARDSON (Imperial Chemical Industries Ltd.) vice-president. Vacancies on the council were filled by DR. G. W. Cooke (Rothamsted Experimental Station), MR. H. B. HILL (Scottish Agricultural Industries Ltd.), and MR. H. C. KIDD (West Norfolk Farmers' Manure and Chemical Cooperative Ltd.).

● MR. C. E. WRANGHAM, C.B.E., B.A., has been appointed joint managing director of the Power-Gas Corporation Ltd. Mr. Wrangham joined the company in 1957. He is also a director of C. Tennant and Co. Ltd., London.

● MR. WILLIAM J. FISCHBEIN, chairman of the Industrial Exchange Company Ltd., 24 Gilbert Street, Brook Street, London W.1, left London on a three-week world tour on Monday, 1 June. He will cover Canada, Australia, New Zealand, Malaya, Ceylon and Pakistan in connection with his company's activities in chemical industries in the Commonwealth.

● The board of Armour Hess Chemicals Ltd. (see p. 925) is as follows: MR. A. HENDERSON chairman, MR. N. HESS managing director. Other directors are: MR. J. T. BARRIE, MR. J. W. R. HUDSON, MR. M. E. LEWIS (U.S.A.), MR. E. J. MCADAMS (U.S.A.), MR. M. K. SCHWITZER, MR. E. W. WILSON (U.S.A.).

● General sales manager of Williams (Hounslow) Ltd., Hounslow, MR. A. T. YOUNG, has left the U.K. for a short tour of South Africa and the Middle East.

● MR. R. G. C. STEPHENSON, managing director, Indian Oxygen Ltd., has been appointed managing director, the Commonwealth Industrial Gases (Australia) Ltd. Both companies are subsidiaries of the British Oxygen Co. Ltd. MR. R. C. BOOTH, finance director and secretary, the Commonwealth Industrial Gases Ltd., has been appointed assistant managing director.

● MR. I. H. GORDON has been appointed assistant sales manager of Cambridge Instrument Company Ltd., 13 Grosvenor Place, London S.W.1. This appointment is part of the expansion of the sales organisation. Mr. Gordon will provide additional liaison between head office and the company's 10 branch offices, and will assist sales promotion generally.

● Executive committee of the Association of British Manufacturers of Agricultural Chemicals for 1959-60 is as follows: A. W. BILLITT, Boots Pure Drug Co. Ltd.; DR. J. R. BOOER, Lunevale Products Ltd.; E. T. BUGGE, Bugges Insecticides Ltd.; C. L. CHAFER, J. W. Chafer Ltd.; R. V. CRAVEN, W. J. Craven and Co. Ltd.; J. F. H. CRONSHEY, Plant Protection Ltd.; M. N. GLADSTONE, Fisons Pest Control Ltd.; D. NAHUM, Pan Britannica Industries Ltd.; J. WALKER, A. H. Marks and Co. Ltd. Hon. auditor is D. J. S. HARTT, May and Baker Ltd., and secretary is W. A. WILLIAMS. Names of other officers were given in 'People in the News' last week.

● MR. H. G. W. CHICHESTER-MILES, chairman of the Empire Rubber Co., and of Rubber Bonders Ltd., has been elected president of the Federation of British Rubber and Allied Manufacturers for 1959-60. Vice-presidents for the same term are MR. S. D. SUTTON, of Veedit Ltd. and MR. C. H. M. BAKER, of the Firestone Tyre and Rubber Co. Ltd.

● DR. PETER L. PAUSON, reader in the Department of Chemistry, Sheffield University, has been appointed to the Freeland Chair of Chemistry at the Royal College of Science and Technology Glasgow. He succeeds PROFESSOR F. S. S. SPRING, who is leaving to take up an appointment as director of research with Laporte Industries Ltd. Dr. Pauson graduated B.Sc. with first-class honours at Glasgow University in 1946 and held the Henry Ellison Research Fellowship at Sheffield University graduating Ph.D. in 1949. He served at Pittsburg University from 1951-52 and then at Chicago University followed by a year at Harvard as a Du Pont research fellow. He has published some 30 research papers. Dr. Pauson takes up his duties on 1 September.

● MR. K. A. BALLARD has joined the Sandiacre Screw Co. Ltd. as London manager.

● SIR ERNEST GOODALE, C.B.E., M.C., was re-elected president of the British Colour Council at the recent annual meeting. MR. H. G. DOWLING was re-elected chairman. Members of the board of management include MR. S. W. WEYSON, Imperial Chemical Industries Ltd.

● DR. PAUL BAUMANN, chairman of the board of directors of Chemische Werke Hüls A.G., of Marl, West Germany, and chairman of the board of administration of the Bunawerke Hüls G.m.b.H. synthetic rubber concern, also of Marl, has been awarded the Grand Order of Merit of the Federal Republic by order of the Chancellor, Dr. Adenauer. Dr. Baumann was awarded the Order, one of the highest civil distinctions in West Germany, by the Minister of Trade in the State Government of North Rhine-Westphalia, in which state both of Dr. Baumann's companies are situated.

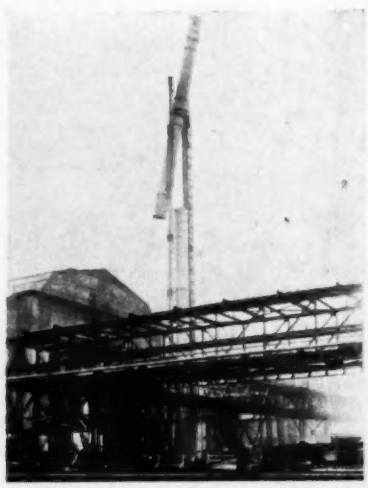
● SIR ALEXANDER FLECK, chairman of Imperial Chemical Industries Ltd. has made a trust deed in favour of the University of Glasgow and the Durham division of the University of Durham. Income from the trust fund will be used at Glasgow to make Alexander Fleck awards to forward research in chemistry, and at Durham to make Isabel Fleck awards to forward research in history.

● MR. D. C. LENNON, 31-year-old senior chemical sales engineer of Humphreys and Glasgow Ltd., London, has been appointed a director of Société de Construction d'Appareils pour Gaz a l'Eau et Gaz Industriel, an associate company. Mr. Lennon joined Humphreys and Glasgow in June 1957 after spending a year in the U.S. on a Stuart Goodwin Fellowship. Previously he was process and sales engineer for Foster Wheeler Ltd. in the U.K. and in the U.S. Since 1957, he has been in charge of chemical plant sales for Europe and was for some time stationed at Milan. The new appointment takes effect immediately.

Will

MR. WILLIAM HENRY PHILLIPS, director of Staffordshire Chemicals Ltd., Stoke-on-Trent, who died on 26 February, left £11,893 net.

Rubber-lined Fume Stack for Kaynitro Plant



Erecting a fume stack at the I.C.I.'s new Kaynitro plant at Billingham. It has been lined with 3/16 in. rubber by the Dexine Rubber Co., Rochdale, to give protection against chlorides and sulphates at temperatures up to about 60°C. Spray towers for de-dusting gases in the same plant will also be lined with rubber

Market Reports

SUSTAINED ACTIVITY IN CHEMICALS

LONDON Activity on the industrial chemicals market has been well sustained during the past week, but there has been no outstanding feature. Contract delivery specifications have covered good quantities, while enquiries from home users are no longer confined to near delivery dates. Zinc oxide prices continue to fluctuate and are dearer as from 25 May, red seal being currently quoted at £94 per ton for 2-ton lots. Elsewhere in this market and also in the coal tar market product prices are unchanged and steady.

MANCHESTER Reasonably steady trading conditions have been experienced on the Manchester market for heavy chemical products. The majority of industrial users are taking steady supplies of the alkalis and other leading heavies against contracts, and there is a fair movement in exports. Enquiries covering a fairly wide range of products are circulating on both the home and shipping sides of the trade. Prices are held pretty well through the market. Seasonally quiet conditions are reported in the fertiliser section and not much in the way of new business is booked.

GLASGOW Continued activity during the past week is reported from the Scottish market. In some sections of industry there is still some recession, but in general the position has been well maintained. Quite a volume of enquiries has been received and demands have covered a varied range of chemicals. Deliveries against contract requirements have been well taken up. Prices generally have remained firm.

The overseas market has shown little change and the position in regard to agricultural chemicals is unaltered with a considerable volume of enquiries and demands being received in keeping with seasonable requirements.

Q.V.F. to Supply World's Largest Chlorine Cooler

AN ORDER for a glass chlorine cooler with a cooling surface of 2,400 sq. ft. and capable of cooling 40 metric tons of chlorine per day has been received by Q.V.F. Ltd., Stoke-on-Trent, Staffs.

Worth £10,924, the apparatus comprises 40 by 60 sq. ft. glass cooler mounted in four vertical banks. Mr. J. G. Window, Q.V.F. sales director, states that the cooler is thought to be the largest all-glass chlorine cooler in existence. It is for delivery to the Argentine and is Q.V.F.'s biggest S. American order to date.

New Resin "An Improvement on P.T.F.E."

A FLUOROCARBON resin said to have less deformation under load than polytetrafluoroethylene and an expansion when it is exposed to heat of only one-sixth that of p.t.f.e. is being marketed by Polypenco Ltd., 68 Tewin Road, Welwyn Garden City, Herts, under the name of Fluorosint.

It has been made to improve the mechanical and thermal properties of p.t.f.e. without materially affecting its electrical and chemical properties.

The dimension tolerances of parts made with the new compound, it is claimed, can be held to within limits that are from one-third to one-sixth those which are obtainable with p.t.f.e. Parts made with the new resin are also said to be remarkably free from stresses and can withstand continued changes of temperature. Bearings are said to be capable of operating at much higher loads and speeds than bearings made from p.t.f.e.

Fluorosint can be supplied in the form of rods and tubular bars for fabrication into components, or it can be moulded to customers' requirements.

A.Sc.W. Want Wage Rises

A resolution instructing the executive of the Association of Scientific Workers to negotiate this year for substantial wage increases for all sections of the membership was passed at their conference.

I.C.I. Titanium

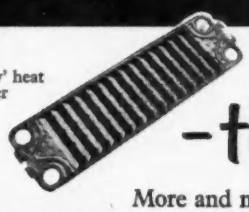
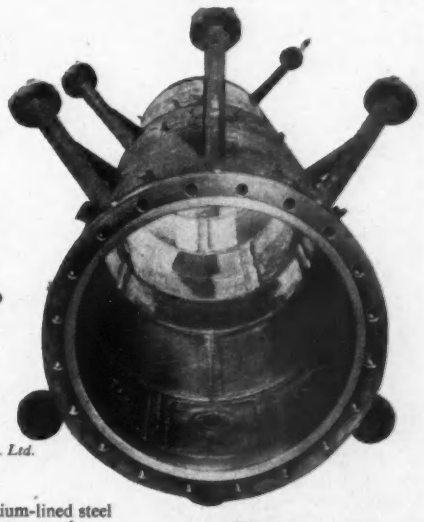


Plate for 'Paraflow' heat exchanger

-the answer

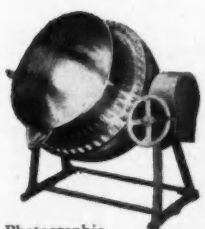
Welded pump impeller

More and more, chemical engineers are turning to I.C.I. Titanium as the solution to some of their most harassing corrosion problems. Shown here are a few recent applications.



Titanium-lined steel reactor vessel

Photos. by courtesy of: A.P.V. Co. Ltd. J. R. Bramah & Co. Ltd. Ilford Ltd. and H. Braithwaite & Co. Ltd. Marston Excelsior Ltd. Royal Dutch/Shell Group



Photographic emulsion pan, titanium lined

Condenser

Breeches piece for handling wet chlorine gas

Automatic pickle drum

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1.

ICI METALS DIVISION

TM 30b

Commercial News

- **Ashe Chemical Net Profit Up by £2,000**
- **Cooper McDougall Cut Bank Overdrafts**
- **£41,000 Cut in Laporte's Net Profit**
- **African Explosives' £2 m. Capital Raise**

Ashe Chemical

A final dividend of 10% is announced by Ashe Chemical Ltd., making 15% for the year 1958 (13¼% in 1957).

Group net trading profit has increased to £99,166 (£97,122), less depreciation of £12,212 (£11,084), written off on termination of lease £4,902 (nil) and tax of £39,098 (£41,049). Net profit is £33,950 (£36,450).

Cooper McDougall

Trading conditions of Cooper McDougall and Robertson were affected by such adverse factors as weather, exchange rates, and wool prices, stated Sir W. H. Cooper at the annual meeting. Group trading profit for the year ended 31 December 1958 was £120,170, compared with £258,162 in the previous year. Consolidated profit before taxation was £165,246. From the consolidated net profit of £96,921 there is a modest retention of profits by subsidiary companies leaving the net profit of the parent company at £95,609.

Income from the associated companies has been reduced by the sale of the company's shares in Plant Protection Ltd. (£799,375), which has enabled Cooper McDougall and Robertson to reduce their bank overdrafts.

A dividend of 10% is recommended, less income tax, on the ordinary shares. A distribution of 2½% is also being made on these shares out of capital profits realised during the year.

Crookes Laboratories

A dividend of 12½% is being paid by Crookes Laboratories Ltd., vitamin and pharmaceutical manufacturers, for the year to 31 March last, on doubled capital (same equivalent).

Subject to audit, net profit shows a decline of £4,734 over last year.

Laporte Industries

Dividend at 8% is being maintained by Laporte Industries Ltd. for the year to 31 March 1959 with a final of 5½%.

There was a decline in group surplus from manufacturing and trading from £2,908,894 to £2,860,238 and the net profit is down from £1,045,182 to £1,003,738. Taxation took £809,640 as against £1,053,763 for the previous year. Depreciation was increased to £968,786 compared with £702,872. Net income of the parent company was £559,264 as against £530,115.

Turner and Newall

For the first half of the current financial year, Turner and Newall Ltd. announce somewhat reduced group profits. The reduction is stated by the directors not to be of a significant character.

Turnover of the home manufacturing companies was well maintained, but in some cases profit margins were lower.

Interim dividend is being maintained at 5% on £21,889,436 ordinary in respect of the year ending 30 September 1959 for 1957-58 the final was 10%.

Reichhold Chemicals

Group profits for 1958 of Reichhold Chemicals, before tax and after depreciation of £96,220 (£81,521), and directors' fees, were £395,184 (£316,334). Tax took £214,601 (£177,931). Group profits after tax were £186,276 (£149,124). Final dividend of 12½% is proposed on increased ordinary capital (final of 10% and bonus of 2½%).

AB Astra

Sweden's leading pharmaceutical producers, AB Astra of Sodertalje, report a 15% rise in turnover for 1958, the total being Kr.132.5 million (about £8.8 million), against Kr.115.4 million (about £7,650,000). Net profit was Kr.3.7 million (about £240,000) compared with Kr.3,120,000 (about £200,000).

African Explosives

It is proposed to increase the capital of African Explosives and Chemical Industries by £2 million. Arrangements have been made for the issue, later this year, of £3.5 million shares at par in liquidation of loans. This would exhaust the reserve shares.

Dominion Tar

Mr. W. N. Hall, president of Dominion Tar and Chemical Co. Ltd., at the annual meeting in Montreal, forecast a slightly increased share earnings for current year. Dominion Tar had a net income in 1958 of $7,304,497, equal to $1.40 a common share (compared with $6,560,586 and $1.25). First quarter profits were substantially higher than last year. The 1,780-ft. shaft for the new salt mine at Goderich, Ont., has been completed and production is expected within two months.

E. Merck

Increased competition and import controls reduced the overseas trade of E. Merck A.G., of Darmstadt, W. Germany, but higher home sales resulted in a net profit raised to DM.3,110,000 (about £250,000) for 1958 compared with DM.2,470,000 (about £206,000) the previous year. A dividend of 10% (8%) has been declared. So far the current year's turnover is up by 10% on 1958.

Olin Mathieson

Sales of Olin Mathieson Chemical Corporation in the U.S. and Canada increased 25% and net profits rose 43% in the first quarter of 1959, compared with the same period in 1958. Net sales and operating revenues in the first quarter of this year were $159,909,000, compared with $127,625,000 in the first three months of 1958. Net profits totalled $6,395,000, or $.48 per share, in this year's quarter, compared with net profits of $4,473,000, or $.33 per share.

NEW COMPANIES

ANGLO-FRENCH MINERALS LTD. Capital £5,000. Agents, distributors and merchants for the supply, distribution, handling and disposal of phosphate, etc. Subscribers: C. Garandeau, 11 Tower Road, Tadworth, Surrey, agent general, and H. W. Hunt.

JOHNSON AND JOHNSON ITALIANA LTD. Capital £100,000. Manufacturers of and dealers in pharmaceutical, medical, medicinal, surgical, toilet, dental, anatomical, orthopaedic, obstetric, gynocological, veterinary, chemical, electrical, photographic, scientific and industrial apparatus, appliances, compounds and preparations, etc. Subscribers: Eric H. Marsh, 37 Hyde Park Gate, S.W.7, managing director; and Reginald L. Cooper, company secretary.

LAWRENCE CHEMICAL CO. LTD. Capital £100. Manufacturers of and dealers in chemicals and chemical preparations, including rust preventive varnishes, lacquers, paint, etc. Directors: John H. Laurence, Mrs. Ruth Laurence. Reg. office: 80 Wimpole Street, London W.1.

MANDERSTAM LOWE AND PARTNERS LTD. Capital £100. Consultants, advisers, designers to engineers, metallurgists, chemists, architects, pulp, paper and cloth manufacturers, and to supervise the design, lay-out and erection of engineering or chemical plants, processes and equipment, etc. Directors: L. H. Manderstam, P. H. Wilson and J. C. Lowe. Reg. office: 38 Grosvenor Gardens, London, S.W.1.

TETROL SERVICISED LTD. Cap. £9,000. Manufacturers of and dealers in bituminous rubber compounds and elements thereof, construction materials, etc. Directors: S. Trisk, H. Wolff, D. A. Jacobs and J. Hurst. Reg. office: Tretol House, The Hyde, London N.W.9.

DIARY DATES

WEDNESDAY 10 JUNE

Royal Inst.—London: 21 Albemarle St., W.1, 9 p.m. 'Colour in inorganic chemistry', by Prof. R. S. Nyholm.

S.C.I.—London: Royal Commonwealth Soc., Northumberland Avenue, W.C.2. 'The utilisation of apples and citrus fruits'. Exhibition open from 10 a.m. Talks at 10.30 a.m., 2.30 p.m. and 5.30 p.m.

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OTHER OFFICES: 352-364 Euston Road, London, N.W.1 (Head Office). TELEPHONE: EUSton 3456
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TRADE NOTES

Non-Toxic Food Colours

New South African agents for Williams (Hounslow) Ltd., manufacturers of dyestuffs, fine colours and chemicals, are Powley and Co. (Pty.) Ltd., 21-24 Queens House, 11 Queen Street, Durban. They will act for the company from 1 July.

At the forthcoming British Plastics Exhibition, Williams (Hounslow) will be showing a new range of non-toxic colours for polythene for food packaging. These colours are based on colours permitted under the U.K. food regulations and avoid any possible toxic contamination of the foodstuffs by the possible toxic extraction of any substance from polythene by the foodstuffs.

New B.D.H. Chemicals

New entries in the catalogue of the British Drug Houses Ltd., Poole, Dorset, include *n*-dodecylamine (laurylamine), which has been shown to be useful as a flotation agent for quartz and feldspar. It forms an addition product with aluminium chloride which may be useful as antiseptic, bactericide, insecticide and fungicide. Among many applications it can be used in the preparation of pigments, to accelerate rubber vulcanisation and to increase the stability of vitamin A in animal feed.

Other new entries are sodium dehydroacetate, with applications as fungicide and bactericide; stannic sulphide, or mosaic gold, a bronzing powder, and thymolphthalein complexone, a metallochromic indicator which, owing to the presence of a stable lactone ring, reacts only in alkaline solution.

Crease Retention

Research work, sponsored by Marks and Spencer Ltd. and carried out at Leeds University under Professor J. B. Speakman, has produced a new finish for imparting durable creases or pleats to woollen garments. Proban Ltd., 1 Knightsbridge Green, London S.W.1, are marketing this finish under the registered trade mark Immacula.

The finish is applied by the cloth finisher. At the final pressing of the garment the chemical change giving crease retention is brought about.

Polythene Film Folder

British Cellophane Ltd., 9 Henrietta Place, London W.1, have issued a folder with samples of polythene film in five gauges. Information is given on the forms in which the film is supplied and yield and length per roll of the different gauges.

Price's Agents for Italy

Price's (Bromborough) Ltd. announce the appointment of Beghe and Chiapetta, Via Isonzo 25, Milan, as the selling agents in Italy for Price's stearines, oleines, fatty acids, cloth and textile oils, and fatty alcohols.

Beghe and Chiapetta have a head office in Milan and branch offices in Turin and Biella. In addition they are served by agents in Genoa, Florence, Rome, Naples, Mestre (Venice), Ancona, Bari, Sardinia and Sicily. With the acceptance of the agency for Price's products they make their first entry with British materials into the oleochemical field. They also have a manufacturing division. They produce sulphates and sulphonates from dodecyl benzene and fatty alcohols for use as industrial detergents and in the textile field. Beghe and Chiapetta are also associated with S.I.P.C.A. in the production of a comprehensive range of metallic salts and metallic stearates.

Agents for Beverol Greases

Chas. H. Windschuegl Ltd., 1 Leadenhall Street, London E.C.3, have been appointed sole agents in the U.K. for Beverol motor and industrial oils and greases made in Holland by Beverolfabrieken N.V., Beverwijk. Lime soap greases with special properties are waterpump grease, high pressure grease, graphited grease and Arctides for use at temperatures of −55°C to +100°C. Aluminium soap greases are suitable for high pressure lubrication, while sodium soap greases are produced for the lubrication of bearings, and for use at high temperatures. Multi-purpose grease, with lithium soap base.

Materials Handling

One of the most comprehensive catalogues published on materials handling is now available from G. Hunter (London) Ltd., 80 Fenchurch Street, London E.C.3. Comprising 174 pages this general handling catalogue covers cranes, hoists, lifting tackle, jacks, conveyors, stackers, fork trucks, pallets and stillages. Sections deal with modernising despatch bays and the design of gravity roller conveyors.

Imported Photometric Equipment

Potential orders valued at £50,000 resulted from an exhibition of photometric and microscopic equipment manufactured by Carl Zeiss, Oberkochen, Western Germany, at the showrooms of their U.K. agents, Degenhardt and Co. Ltd., 6 Cavendish Square, London W.1, in Whit-week.

Orders were placed in particular for the PMQII spectrophotometer, which is designed for rapid quantitative and qualitative analyses of compound substances. It is of advanced design but the handling technique is simple. The much less expensive Elko II is claimed to be so accurate that it will determine 0.01% phosphorus in copper in 15 minutes.

Change of Name

W. James Davies (Western) Ltd., 42 The Parade, Cardiff, have changed their name to Rudkin Chemical Engineering Co. Ltd.

Newman Open Newcastle Office

The Electric Motor Division of Newman Industries Limited, has opened an additional area office at 59 Grey Street, Newcastle upon Tyne 1. (tel.: 2-3970).

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 15 July

Production of azoic pigments. General Aniline & Film Corp. **816 585**

Process and an apparatus for carrying out distillation and rectification of fluid mixtures. Raffaeta, R. **816 522**

Production of silica aquasols. Monsanto Chemical Co. **816 755**

Process for working up alkali metal terephthalates. Henkel & Cie, G.m.b.H. **816 691**

Polymerisation process. Ethyl Corp. **816 586**

Production of fluoroform. National Smelting Co. Ltd. **816 622**

Bitumen composition. Esso Research & Engineering Co. **816 669**

Bonding of polyethylene terephthalate fibres to rubber. Imperial Chemical Industries Ltd., Knowles, E., and Meyrick, T. J. **816 640**

Kneading and mixing materials, such as ceramic or like materials, together. Rümcke, [nee Slik], F. H. **816 555**

Slack wax oxidation process. Esso Research & Engineering Co. **816 670**

Manufacture of metallised polytetrafluoroethylene and products thereof. British Dielectric Research Ltd. **816 641**

Plasticising and gelatinising agents for high-polymeric substances. Dehydag Deutsche Hydrierwerke G..m.b.H. **816 528**

Coating rigid sheet materials with thermoplastic synthetic resins. Halvic Kunstoffwerke G.m.b.H. **816 696**

Preparation of heterocyclic carboxylic acids. Henkel & Cie G.m.b.H. **816 531**

Purification of acetylene. American Cyanamid Co. **816 588**

Vitamin B_{12}. UCLAF. **816 425 & 816 426**

Transforming substituted amides of *l-iso*lysergic and *l*-lysergic acids into equal derivatives of *d-iso*lysergic and *d*-lysergic acids. Semonsky, M., and Cerny, A. **816 697**

Purification of alkyl aryl sulphonates. Continental Oil Co. **816 533**

Silicone-modified polyester resins. Westinghouse Electric International Co. **816 535**

Silica glass and process for its manufacture. Quartz & Silice. **816 412**

Manufacture of hydrocarbon substances from oil shale. Dow Chemical Co. **816 537**

Pharmaceutical compositions containing serpajmaline. Siddiqui, S., Deininger, R., and Din, M. A. **816 654**

Isolation of alkaloidal materials. Siddiqui, S. **816 655**

Recycle hydroisomerisation process. Gulf Research & Development Co. **816 591**

Process for the production of highly porous and more especially hard light-weight materials. Farbenfabriken Bayer A.G. **816 413**

Phenthiazine derivatives and their preparation. Soc. Des Usines Chimiques Rhonepoulenc. **816 538**

Preparation of alumina-containing formed pieces which are suitable as absorbents. Bataafsche Petroleum Maatschappij N.V., D. E. **816 540**

Preparation of stable magnesium solutions of high concentration. Benckiser G.m.b.H. Chemische Fabrik, J. A. **816 592**

Cleaning of dust-laden gas filters. Maschinenfabrik Beth A.G. **816 496**

Process and apparatus for distillation of hydrocarbon mixtures. Bataafsche Petroleum Maatschappij N.V. D. E. **816 627**

Extracting uranium compounds from their solutions. Atomenergi A.B. **816 628**

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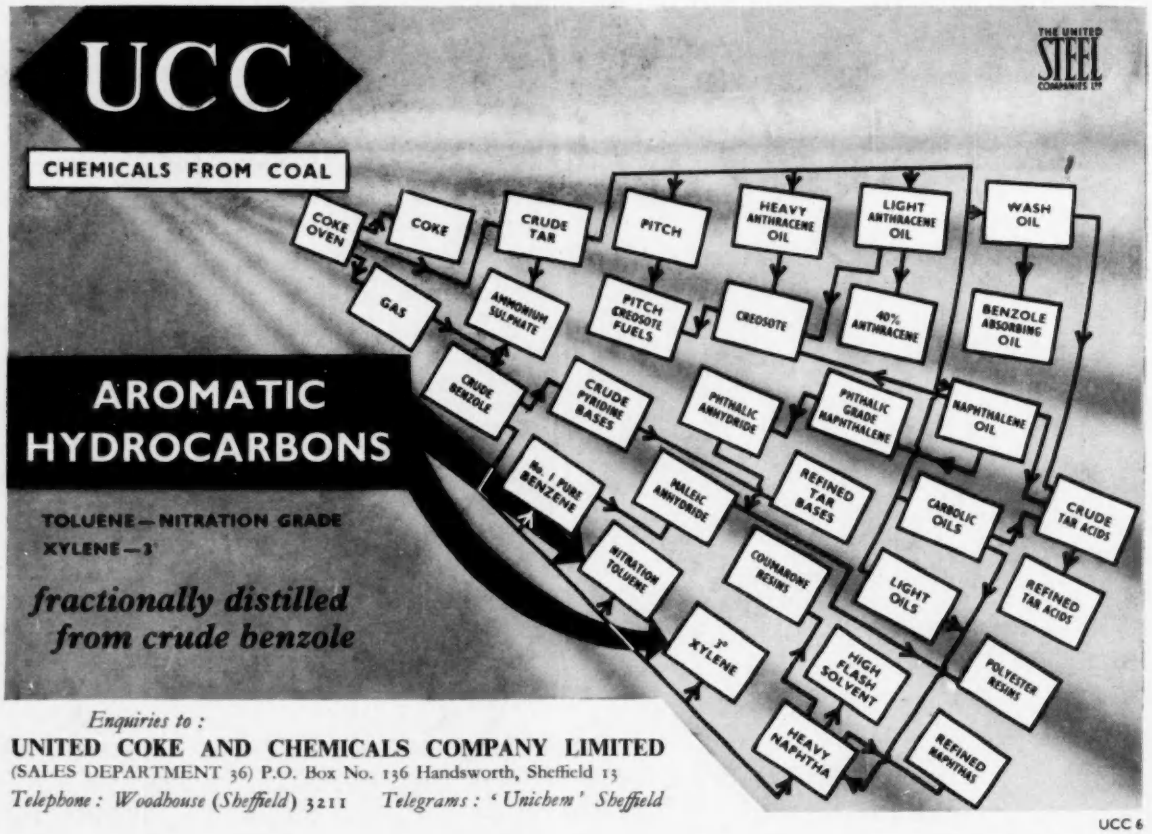

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